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Pertaining to the Photography of All
Things Which Live or Which Have Lived

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Information from the Electronmicrograph*

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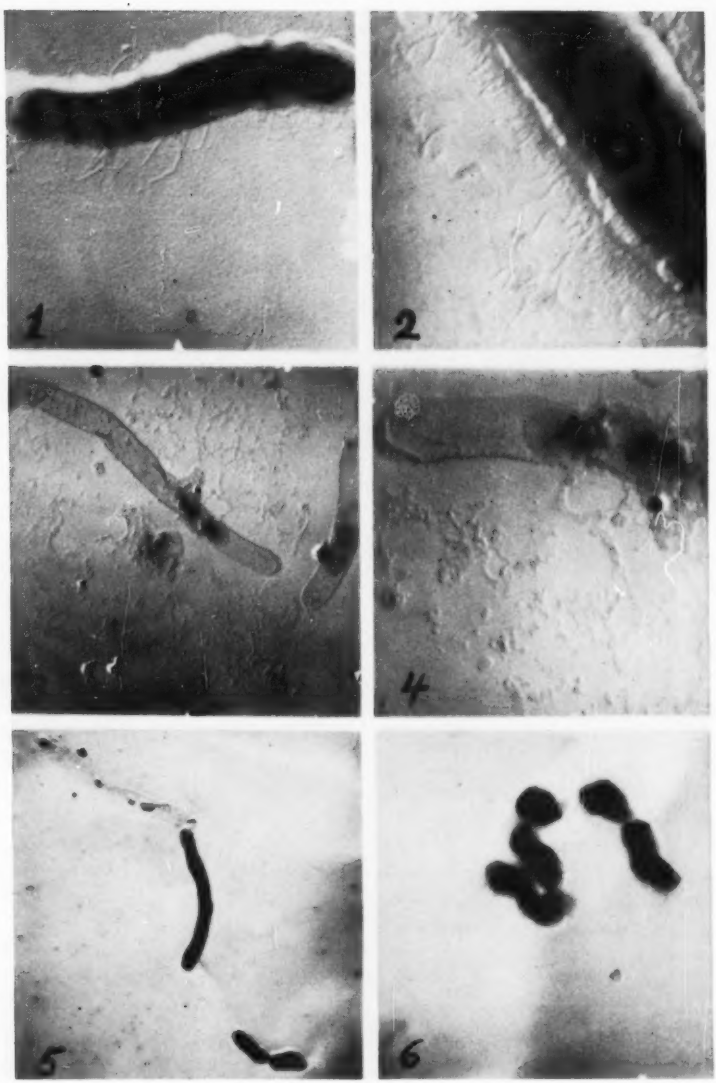
THE electronmicrograph, in its broadest application, extends beyond the common concept of the photograph as a means of record. It can reveal phenomena never seen before, therefore, new information not otherwise obtainable (Wyckoff, 1949). At one time the biologist studied the entire living organism, plant or animal, as a whole. Later he sought to study an organ, then, one kind of tissue or cell. Now we study intra-cellular components on the macromolecular level rather than on the cellular level of organization.

It must be emphasized that the electronmicrograph is difficult to interpret, because an attempt is made to associate a conventional concept with pictures of particles which do not form a part of previous experience. To recognize phenomena never seen before is a contradiction of words. This is demonstrated by the studies on the virus of poliomyelitis. No one claims to have seen this virus because there are presumably only very few virus particles in a piece of infected nervous tissue, and they closely resemble normal tissue components. No adequate methods have yet been developed to concentrate this virus which is about 25 mμ in size. The virus of hoof-and-mouth disease, never recognized in electronmicrograph, is only ca. 10 mμ in diameter which is roughly comparable to the size of a normal protein molecule exemplified by egg albumin which is 2.5 x 10 mμ in size (Rivers, 1948). Although a conservative, hesitant attitude toward the interpretation of the electronmicrograph must be held, this must not be done at the expense of progress. There is much that can be learned by the use of this instrument.

The purpose of this article is to demonstrate a host-virus system, which has never been electronmicrographed before and to explain the deductions made from the pictures (Azarowicz and Plunkett, 1953). This system consists of a host cell, a species of *Nocardia* which resembles the bacteria, and the virus which attacks the host cell. Plaque formation can be demonstrated on solid medium, and inhibition of growth can be shown in broth.

It is seen that the virus is a rod-like or sigmoid particle about 260 mμ in length. It orients itself at right angles to the cell in young cultures of 44 hours as seen in Figure 1, taken at an original magnification of 12,800x. Control cul-

* Received for publication September 15, 1953.



See text for explanation of figures.

tures without added virus do not show these rod-like particles. Figure 2, taken at 20,400x shows a cell wall under attack. The cell membrane appears to be broken at several intervals, and viral particles appear to be entering the cell. This may represent the mode of entry of the virus. If we do, indeed, have what is indicated, then this system may serve as a reduced, simplified model for the study of viral pathogenesis. Figure 3 shows a lysed cell which typically shows a break in the cell wall near the center of the cell, with all the cytoplasm near the center of the cell being extruded with the nucleus. Figure 4 at 10,800x is a close up of Figure 3, showing a well defined intact nucleus being extruded. It is interpreted that the virus attacks and multiplies within the cytoplasm, sparing the nucleus. At 92 hours, Figure 4 at 7800x, the rod-like particles have now disappeared, and only unexplained round particles (virus?) can be seen adhering to resistant cells. Figure 5 shows the resistant cells which begin to appear at about 92 hours; the cells show alternately lysed and spared cells. Figure 6 shows cells of the resistant population at 92 hours which appear stubby, sigmoid, bizarre.

Summary

In summary, it has been shown that a viral particle has a rod-like shape, and is 260 mμ in length. The virus enters the cell through breaks in the cell membrane and attacks the cytoplasm of the host cell without disrupting the nucleus. At about 4 days, resistant cells begin to arise which have a stunted, bizarre, sigmoid form in contrast to the normal, longer, uncurved cell. It appears that in a chain of cells of a susceptible population, a lysed cell is followed by an intact cell. The conventional concept of a round phage, or a phage with head and tail (Fraser and Williams, 1953) finds an exception in this phage which occurs in a rod-like form only.

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The following item of interest appeared in the January 30, 1954 number of the J.A.M.A.:

EFFECT OF PHOTOGRAPHIC FLASHLIGHT ON THE EYES

TO THE EDITOR: — *I am inquiring about photographic flashlight, especially electronic flash, about 1/1,000 second of 16 lumen seconds of light per square foot at 9 ft. Pictures of babies, even newborn infants, are often taken in dim rooms, with the pupils fully dilated and the baby staring at the camera. Can this harm the eyes?*

M.D., Arkansas

ANSWER — The amount of light reaching the subject has apparently been measured as 16 lumen seconds per square foot and delivered in the course of about 1/1,000 second. Theoretically there is insufficient ultraviolet or infrared radiation from the standard electronic discharge tube to be harmful to the exterior or interior of the eye, even when the gaze is directed on the light source, unless the intensity is many times greater than that indicated. Nor have any indisputable cases of eye lesions been reported even though current photographic procedures commonly expose the eye to electronic flashes at a distance much closer than 9 ft. (about 3 m.). No ophthalmoscopic nor microcsopic abnormalities were produced in the eyes of chinchilla rabbits by exposures of more than 2,000 lumen seconds from a discharge tube at a distance of 3 in. (7.5 cm.).

Journal of the Biological Photographic Association Vol. 22, No. 2 May, 1954

Photography in Scientific Research*

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SCIENTIFIC research is concerned with the discovery of laws regulating the universe and the understanding of how it functions. High creative ability is required, but the scientist is limited to an empirical criterion of truth, and many of his working methods are aimed toward testing hypotheses and in the interpretation and integration of what is observed and measured. Despite man's ten or eleven senses, many features of his environment cannot be observed without intermediate translators, of which photography is one of the most useful.

Basic Photography

Photographic recording saves time and frees the investigator for other activities. Automatic cameras photograph meter readings as often as required to record the data. Photomicrographs may provide means for later counting so that individuals may be checked off and no errors made. In addition, such record photographs may make the next analytical step possible. For instance, photographs of yeast populations were used to determine the distribution of the sizes of cells present.

Personnel can be protected from undue exposure to radiation hazards by wearing badges containing photographic material to record exposure and from which cumulative radiation may be estimated.

Duplication without error or records is one of the common uses of photography in research. By masking part of the record, selected parts may be excluded or scales may be included in the duplicate. Duplicates can be made available to others, or stored under proper conditions to provide reasonably permanent records. The use of photosensitive glass may have use for reference grids of more permanent types of records.

One of the chief difficulties at the present time is the rapid increase in our documentary knowledge. Books are being published and magazines produced faster than libraries can grow to keep up with them, or individuals even sample the information. Photographic reproductions such as microfilms and Microcards offer a solution to this problem; as they take less room and may be widely disseminated between individuals or countries. Electronics and special cataloguing may soon be required to analyze the rapidly increasing amount of information and to quickly find and produce those items of the record which bear on a given investigation.

Presentation is very important, from simple illustration to show others what was accomplished, to critical demonstrations of what was observed for showing at scientific meetings. Our fund of knowledge is extended and verified, and photographic material permits others to compare their results with those of the original investigator. A good photographic presentation of a research program may be the means of obtaining sufficient funds

* Presented to the 23rd Annual Meeting, Los Angeles. Received for publication September 22, 1953.

Figure 1. Sea anemonies and sea urchins live together in a tide pool on the Oregon sea coast. (Picture useful to the ecologist and for popular use in education.)

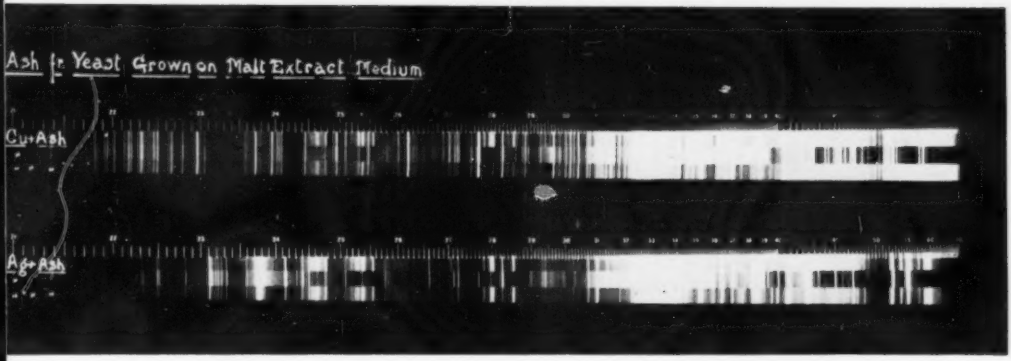

Figure 2. A photograph of line spectra used in the identification of trace elements in yeast. (J. Bact. 1940, 39:739-746).

to carry out the research. Scientists have an obligation to make their discoveries available to all people. Hence the popularization of scientific work is another form of presentation, wherein photography may be more efficient than other communication methods. (Figure 1)

Analytical Photography

Basically, photography is recording by light. Originally only light and long wavelength ultraviolet radiation could be recorded by photographic materials, but now the range is extended to include much short wavelength and the near infrared. Objects which absorb or reflect either generally or selectively can be investigated and the proper choice of the radiation derived from the material and the nature of the investigation. (Figure 2)

Both image and nonimage forming systems are used. Photography is used in photometry for the measuring of radiant energy, in dosimetry for determining the

Figure 3. Head of unstained nematode worm. B– dark contrast phase photomicrograph. Electronic flash, 430X.

amount of energy to which an organism is, or is about to be exposed. In this same class are methods for determining energy leaks and the position of their sources. Such general uses require considerable skill and understanding of the limitations of the photographic method to avoid errors from failure of the reciprocity law, the different sensitivity along the time-gamma curve, etc.

The wave nature of radiant energy makes possible using it in an analytical tool, the waves may be made to interfere with each other, and from the resulting interference patterns one can determine structure, thickness, study surfaces, and possibly the mass concentration in objects. Materials that align the light passing through them (polarization) can be examined for strain, for fine structure deter-

mined by flow refringence and their composition analyzed. Changes due to optical path from differences in refractive index may be determined by phase and Schlieren methods. The former are used primarily in microscopy for the study of transparent materials, (Figure 3) and the latter are used in the study of air streams for the analysis of flying objects, gas compression, and similar phenomena. Electrophoresis is another analytical tool based on optical path differences. These methods utilize changes of energy and are often directly recorded by photography.

Sometimes it is possible to utilize energy which the materials would not normally record to obtain information in research investigations. A simple case of this is color translation where ultraviolet images are photographed and then projected with colored lights so that the relative absorption of the invisible ultraviolet can be seen by the eye. Luminescence phenomena, fluorescence and phosphorecence are photographed, and it is possible to make specimens selectively visible by these means which could not otherwise be seen or photographed. An extreme example is phosphorophotography, which uses the infrared quenching effect of heat to form a photographic record.

Another comparable type of recording is xerography, using imagewise destruction of electrical charges with pigmented materials to make the record.

In looking over the available radiant energy, the eye is sensitive to only a very small part (light) but this is important for human observers because many objects are seen in color. The colors can be recorded by photography and with suitable care and specification, provide scientifically valid color records. Color may be obtained by optical staining methods as with the Rhineberg system in the microscope, or by dispersion staining. Interference, Schlieren, and polarization phenomena frequently show in color and a color photograph may be essential for later analysis.

The invisible long wavelength infrared radiation is useful because of its penetration into materials and its specific absorptions in red and dark materials. Some opaque minerals, e.g. molybdenite, and other opaque materials such as textiles, corals, wood, and the black bodies of insects are transparent to infrared, and photographs of their internal details are easily made. Certain materials can be identified or analyzed with the infrared spectograph. The contrasts in infrared pictures are of great aid to the ecologist and the physician. The aerial photographer examines terrain for the distribution of vegetation for soil erosion. The infrared absorption of water makes coastlines and water boundaries more obvious in the photographic records. A disadvantage of the infrared is that long wavelength radiation gives less resolution. Photographic emulsions are limited at present to the near infrared radiation.

The invisible short wavelength ultraviolet, on the other hand, provides increased resolution and finer details by photography. Some materials have specific absorptions in the ultraviolet which are used to determine their concentrations, e.g. information on some of the ultimate elements of the living cell. Ultraviolet makes many materials fluoresce and the fluorescence (Figure 4) may be used to quantitate the amount, or to locate materials such as fungus infections, antimalarials within the organism, antiseptics on dressings, etc. Koons and his colleagues are using fluorescent tagged molecules to learn the ultimate fate of immune bodies within the organisms. Longer exposures are required for fluorescence despite the apparent brightness

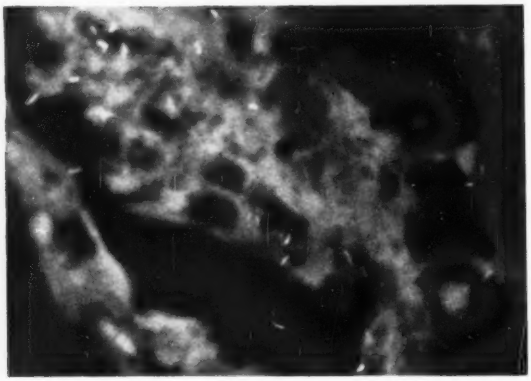

Figure 4. Fluorescent tuberculosis bacteria in lung section 1000X.

X-radiation has great penetration that reveals internal detail. Hard penetrating rays, or softer Grenz rays, are used as needed to obtain a shadow detail (Figure 5) of interior structure. Images are obtained by direct contact, by direct enlargement from a small source of X-rays nearer the specimen than the photographic emulsion, or by image enlargement using mirrors to focus the X-rays. X-ray diffraction analysis has extended our knowledge of the finer structure of matter. Crystalline materials reflect X-rays, and from the pictures of the reflection patterns, it is possible to determine molecular structure. The patterns are also useful for the comparison and identification of materials. (Figure 6)

A field of scientific endeavor where photography has recently greatly expanded is that concerned with nuclear particles and radioactive materials. Alpha rays, neutrons, protons, and gamma rays can be tracked and identified in the photographic emulsion. In autoradiography, the tissue and the photographic emulsion are so aligned that one can determine where the radioactive material was in the tissue. Placing radioactive elements into other molecules labels them so that they may be traced in living and nonliving systems, often by photographs. Emulsions were not too well adapted for this rapidly expanding field, and many of the scientists working in it, like their predecessors, have been forced to make their own plates. However, the facilities of the large research laboratories in the photographic field are gaining on the amateurs and specialized emulsions are being provided for these needs.

Electrons are useful in scientific work for the examination of details in the electron microscope and also the electron diffraction methods for revealing the fine structure of materials. Photographs are used for analysis and for the identification and comparison of materials.

The scientist has a powerful probing tool in radiant energy, and the effect on this probing tool by the material examined indicates the proper photographic procedure and recording medium, although some problems may require the simultaneous use of several media.

The making of a record or the analysis of a record is rarely the final end and the photographic procedure often provides much more information. In fact, it would be tempting to redo this paper in terms of information theory, but time precludes.

Observational Photography

By means of photography, it is possible to make observations where it would not be possible to place the eye, or too dangerous for the human eye; as with endoscopic instruments used for examination of internal organs of the body, inspection instruments used to look down the bores of tubular apparatus, or watching explosions.

High speed cameras make records of events too rapid for direct visual analysis.

Figure 5. X-ray photographs of opaque, dark mussel shells show growth rings.

Perhaps the single greatest gain in scientific research from photography is the ability to control time. Pictures taken at one rate may be projected slower or faster to present a record amenable to analysis.

A second order method has recently come into use. A Vidicon tube is placed in the dangerous situation and the observer watches on a television screen and the camera is used to photograph the screen when records are required. By appropriate choice of tube nonvisible radiation can be used with protection for the observer.

Photographic records before, doing, and after, are of great importance, especially in destructive tests; and with constructive change such as medical cosmetic reconstruction. It is often possible to change one form of energy, into radiant energy and thus obtain photographs for analysis, e.g. sound and speech.

Contrast may be increased or decreased by photographic methods to give more legible records, especially when only small amounts of reading energy are available. When radiation is selectively absorbed it may be possible to make clearer photographic records than can be seen directly with the eye. For example, a red stained bacterium on a blue background may be made lighter or darker than its surround. It often happens in an experiment that one either does not notice all of the detail, or one does not have time to notice all of the detail. Consequently, a photographic record may contain additional information which may be of great importance later when the records are further examined, or when a need has arisen for information which was not noticed in the first case. The anthropologist, ethnologist and sociologist use photographs taken for other reasons as well as their own.

Astronomy early used photography to record the positions of the stars, for spectroscopic and other kinds of analysis and much of our knowledge of the universe

Figure 6. X-ray diffraction photograph identifies cellulose in an animal. (Papers from the Tortugas Lab. 1940, 32:163-167).

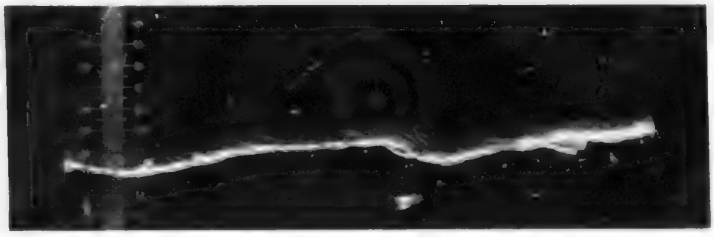

Figure 7. Textile fiber with measuring scale superimposed by a double exposure.

has been discovered from the photographic records.

Measurement is one of the most important aspects of scientific research. The measuring scales are often made by photography, and measurements may be recorded photographically or made from properly processed photographs. It may be necessary to take rapid pictures with electronic flash to stop motion, to give an image sharp enough for measurement. It may be important to compare measurements, and this can be done by double exposure photography. (Figure 7) Sometimes the records are distorted, and by proper photographic processing the records may be rectified. Photogrammetry has become an important part of photographic mensuration. For this work, dimensional stability of the materials is of great importance and due care has to be taken with sufficient checks and control. Through photographic templates it may be possible to design and construct instruments for research which could not be made by other means.

The importance of three-dimensional photography is so great (from human somatology to recording of landscapes and other natural phenomena) that detailed description is no longer necessary.

On the other hand, photography has had considerable reciprocal effect on science; many contributions to physics and chemistry have come about in an attempt to understand the photographic image, and much has been learned about human vision, especially human color vision, because of the demands of color photography.

Despite the many gains of photography to the research scientist, he does regret the slowness of the procedure at times, although the Land-Polaroid Camera is helping here; also one regrets the necessity of so much water and many processing solutions. Stabilizers offer promise in these lines.

Greater sensitivity, speed and simpler equipment would be helpful. Research uses all kinds of photography. It is not possible to consider more than a few typical examples in the time allotted, but it is hoped that this brief summary may suggest other uses and further the profession of photographers.

Journal of the Biological Photographic Association Vol. 22, No. 2 May, 1954

The Role of the Clinical Photographer In the Production of Short Short Motion Pictures*

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IN the realm of motion pictures the Medical Audio-Visual Institute has been engaged in the study of those aspects of film thinking and film production which are other than phototechnical. Its interests have been focused upon the educational aspects of medical films, and upon analysis of the many factors which increase or reduce the use of the motion picture as a medium of medical communication.

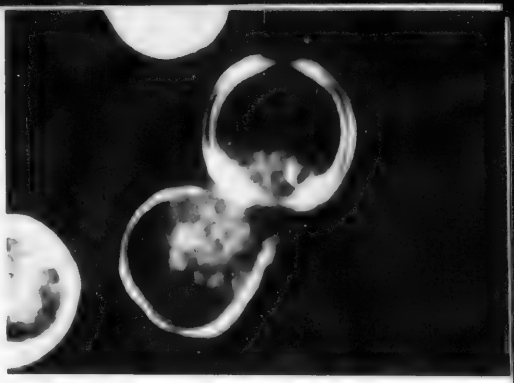
Therefore, it is our purpose to consider very briefly first, the processes of medical education today and second, the implications which these processes must have upon medical film production. Third, we wish to suggest how clinical photographers, administrators of medical photoservice laboratories and other persons concerned with the practical aspects of audio-visual medical education can improve their contribution to the teaching of the medical and health sciences specifically by means of short short motion pictures. And for brevity, the discussion will be limited to the clinical photographer's potential role in supporting classrooms teaching with short short films *in the medical schools.*

This is only a progress report of our continuing work. We sincerely hope that similar work will engage many of you as soon as you return to your schools, hospitals and laboratories. If you are interested in details of our tribulations, the first official report of our production of short short films for cancer teaching is contained in five papers in the JOURNAL OF MEDICAL EDUCATION for February, 1953.[1]

Some Generalities about Medical Education

The medical schools here and abroad are in a vast flux of educational experimentation.[2] This is true not only because they are being asked to teach more students than can readily be handled by the methods of the past, but also because they are being asked to teach immensely more facts and skills to the students than ever before within a time span which probably has reached its practical human limits. The whole fundamental concept of medical education is changing, from imparting *scientific medicine* — the great contribution of these first 50 years of the twentieth century—to teaching *comprehensive*

* From a talk presented at the Annual Meeting of the Biological Photographic Association, Los Angeles, September 1953.



Frame Enlargements from short short films. *Left,* from "Excystation and Motility of Endamoeba Histolytica" by H. E. Meleney, T. L. Snyder, L. C. Kingsland, N.Y.U. School of Medicine. *Right,* from "Mechanism of Anopheline Feeding" by M. S. Ferguson and M. D. Young, Communicable Disease Center, Atlanta, Georgia.

medicine for the whole patient and his family in a world community. The changes are causing a great screeching of gears in both the thinking and the actions of the faculties, you can be sure.

However, we who are concerned with audiovisual communication deal very little with medical education in general. Rather we know medical education in the persons of individual teachers who need help for their own instructional roles. If the teachers are difficult to work with, it is in large measure because they need help so acutely and at the same time are unsure of their solutions. We propose that, as far as medical motion pictures can go in offering a part of the ultimate solution, the clinical photographer can be of very great assistance to faculty members in relieving their insecurity. All of us together can surely help them to teach more and better medicine to more students in less time, and to have their students longer retain their knowledge, skills and attitudes.

When one considers visual education in the medical school classroom, he must remember that this is an arena dominated by individualists, doctors untrained in the theory and methods of teaching, but who nevertheless teach reasonably well through having observed the ways of their own best teachers. These men have learned teaching simply through educational osmosis. Medical faculty persons are usually superior in their intellectual endowments; therefore, they not infrequently do a good or even a splendid practical job of teaching the rich material of medicine. Furthermore, their resolute individualism *does* produce very many good diagnosticians, many good investigators, and a few good teachers. At the same time one can say with certainty that the present-day individualistic medical school teacher uses medical motion pictures very little, for many reasons. The question is: how can we serve this healthy individualism through medical films so that the conscientious but individualistic teacher can steadily enrich his highly personalized instruction with the best motion picture material from laboratories and hospitals everywhere?

The Short Short Film: What It Is and Is Not

At the Medical Audio-Visual Institute we feel that the short short film is at least a tentative and partial answer to the needs of the individualistic instructor. First, it appears likely that production of the short film falls far more within the resources of the average clinical photographic and illustrational service than does the longer traditional lecture film: such services are at the home base of the teacher, and are the tangible and personal resources which

he can call upon for help of many kinds. Second, for professional producers who produce largely for the different and far less exacting postgraduate medical audience, short films as excerpts offer chance for a "double value" in production;[1] through such producers short shorts for medical schools could readily become a routine by-product of longer and more formalized film productions for practitioners, with only slightly increased cost to sponsors. Purchase plans could then bring such shorts into every teacher's personal visual teaching library.

Hollywood's shorts are 11 to 22 minutes long, or 1 to 2 reels. By "short short" we mean a film of lesser length, let us say 100 to 300 feet, or 1/4 to 3/4 of a reel, with perhaps an average of 200 feet, or 1/2 reel. In projection time this means from 2 1/2 to 8 minutes in length, averaging at perhaps 5 minutes.

The criteria for a short short film are not critical. For purposes of convenience we will name a few as working criteria.

1. A short short should concern itself with a simple, unitary concept or phenomenon. One example would be the Communicable Disease Center's film "Movements of Endamoeba histolytica",[3] or Henry E. Meleney's "Excystation and Motility of Endamoeba histolytica".[4]
2. It should be fitted for the motion picture medium. An example would be Malcolm S. Ferguson's "The Mechanism of Anopheline Feeding", from the Communicable Disease Center.[5]
3. It should be of such workmanship that it will meet the esthetic standards of even the discriminating instructor. A negative example will be better in this case. A short film from our own study concerning cytological diagnosis of uterine cancer, prepared from original footage obtained in Switzerland, had inadequate color in its prints, and the shorts were discarded as not up to esthetic standards.

What Is The Short Short Film In Terms of Its Function?

1. It should be as integral to a lecture, laboratory or clinical teaching presentation as are blackboard charts or slides.
2. It should be so factual and noncontroversial that very few individualistic instructors will seriously object to making it a part of *their* own presentation. Hilger Perry Jenkins' films in surgical pathology[6] are an example of an attempt to create simple but universal films for surgical teaching.
3. The short should *not* stand by itself, should *not* seek to be a substitute teacher. It is usually too short, in any event.
4. In its simplest form it should be a "slide in motion", for it performs the same function as a slide by illustrating *in motion* some fact or skill of the lecture or laboratory. Our own loop film from George Ramsey's footage on "Hemangioma of the Brain"[7] is just such a "slide in motion".
5. In its more complex forms the short is a demonstration or illustration of a method, an experiment, or a series of related observations. But each short is presented so briefly that it *demands* integrated use by the instructor. Our new cancer unit "Principles of Proctosigmoidoscopy"[8] shows the anatomical ra-

tionale of a common clinical procedure. Many others of our cancer series fall into this category.

The Role of the Clinical Photographer in Production

What does the clinical photographer have to do to to make short films?

First, make a beginning. Team up with an illustrator and a medical advisor, corral some money, and make a few simple, terse, pragmatic films. It is good to see that William Campbell at the Topeka V.A. Hospital is doing short shorts for presenting classical psychiatric syndromes;[9] in this connection we should recall the series of shorts on "Mental Symptoms" produced by the National Film Board of Canada.[10] At Western Reserve, Bernard V. Dryer has produced a series of procedures in laboratory physiology in short short form.[11]

Second, accept a warning. It takes a large number of the skills of the professional producer plus careful handling of motion picture technology to make short shorts which will be truly acceptable for national mass distribution. Be prepared for failures during the learning process. Local successes in films which are the delight of medical advisor-teachers may not be greeted with very great enthusiasm away from the hearth. But who cares? Use the shorts locally until they are scratched into oblivion. Then discard them, and produce better ones. They can be considered as trial films. And you will be learning about the visual language of the motion picture, which is something a great deal more complex than merely exposing film properly.

Third, keep some routine motion picture *production methodology* clear in your minds. (a) Think through your short *completely, in advance.* (b) Think it through in *pictures,* not merely in words. Of course do *both.* (C) Learn to be constantly aware of the four problems of visual language in film: visual *orientation;* visual *coverage of action;* visual *pointing* by camera, by processing, and by animation; and visual *bridges* by pan and follow, by opticals and by astute editing. (d) Learn how to handle titles, labels, and narration, including magnetic tape stripes.

Fourth, begin to think of *distribution* of your own and others' shorts. Shorts should be owned, not loaned. The essence of their effective use is ownership. Since *your* shorts may be sold, you should carefully protect the original footage, never projecting it but always manipulating work prints made from the original.

Copyright the short to protect yourself and your patients, if you think it will ever be widely used. If there is a potential sale to educational TV channels, which may well occur with certain subjects — for example, medical news material like the Brody twins[13] — copyright will help safeguard any possible small income which may come back to you.

Build up a budget to buy short films made by others. And induce departments to buy more shorts through you. As you create a need, so will you create work for and respect for yourselves as special professionals of medical education.

Film distribution is poorly handled if too many agencies seek to handle the motion pictures. For a royalty, a contract can be made with someone like our Medical Audio-Visual Institute for distributing your shorts, rather than trying to handle them yourselves. Or distribute through your university film library.

Since knowing about the very existence of your short films is crucial to teachers, please become informed of the Library of Congress motion picture reference

cards.[14] These printed cards, with information supplied by you, can notify everyone of the existence of a potentially useful short.

Fifth, begin to think of proper *utilization* of short shorts. With personal film ownership, medical teachers can edit and re-edit as they choose, tacking one short onto the end of another, taking out a short bit, inserting their own new shot, etc. This means that you may want to teach the faculty personnel the methods of editing, and to permit them the use of your splicer, rewinds, reels and viewer.

With individualistic use of shorts, the teacher will often want to use his own narration. You will be able to help him do his own magnetic tape recording, and can advise him on how best to proceed.[12]

With departmental ownership, someone must know that films exist somewhere in the school, and are recorded as property. A card file record may be necessary. Proper storage against deterioration, and proper identification against loss may well become your responsibility.

Classroom utilization of shorts has many unknowns. One thing not unknown is the need for good and reliable projectionists. The role of the clinical photographer in facing the problems of integrated short films is to *avoid* being involved in their projection. Instead, training and support of student or junior faculty projectionists[15] will perhaps answer all medical school needs far better in both short and long views.

Summary

1. The short short appears to be a film species adapted for individualistic medical school teachers.

2. Large scale production of shorts is needed. Such shorts will be the road to film literacy for many of us, since the resources of the average clinical photographer suggest that he should proceed to learn motion picture technological skills by way of short shorts. The intrinsic characteristics of visual communication should of course be found in all shorts.

3. Information, distribution and utilization of short shorts contain many steps to be taken, and many problems which can be solved by forethought and trial.

Make a beginning. Be humble, hard-working, learnable. For the short short is probably your special field in medical cinematography.

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A Method of Motion and Time Analysis for the Evaluation of Prosthetic Devices*

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Introduction

SINCE the inception of *Artificial Limbs Research* under the auspices of the *National Research Council* in 1945, motion studies have been used for purposes of fundamental research and evaluation. There can be little doubt as to the pertinence of motion analysis since the job of restoring the function of an amputated limb by the prosthetic device involves first, a study of the motions of the natural limb and second, a comparison of prosthetic movement and natural movement.

This presentation is concerned with a brief description of the motion and time method for the evaluation of prosthetic devices developed by the *U. C. L. A. Engineering Artificial Limbs* project.

Description

Perhaps the easiest way to describe the motion and time method is to compare it with micromotion analysis as it is used in industry. Figure 1 is a schematic representation of the differences and similarities between the two. Both have a similar problem, i.e., to increase production. In the sense of improving the amputee's ability to meet the vocational, avocational and personal care requirements of everyday living, his productivity is increased.

The concepts for best doing the job differ somewhat in industry and in artificial limbs research. Industry of necessity must stress economic concepts. How can cost be decreased? How can production be increased? Our project, being under Government contract, can be more idealistic and stress the subjective concepts which appear to be most highly correlated with the value attached to amputee performance. First, how useful is the artificial limb and what does it permit the amputee to accomplish? Second, how does the amputee appear to observers when he works with his artificial limb? Third, how much effort is required to manipulate the artificial device?

Neither in industry nor in artificial limb research can these concepts be handled directly. Utility, appearance and effort are subjective concepts and it is difficult to use them as part of an experimental program since agreement as to their definitions is difficult to establish. Therefore, it is necessary to substitute physical concepts which have been shown to be correlated to the concepts of first or primary interest. Industry commonly uses time, alone. In artificial limbs research, extent of movements and number of movements are used in addition to time.

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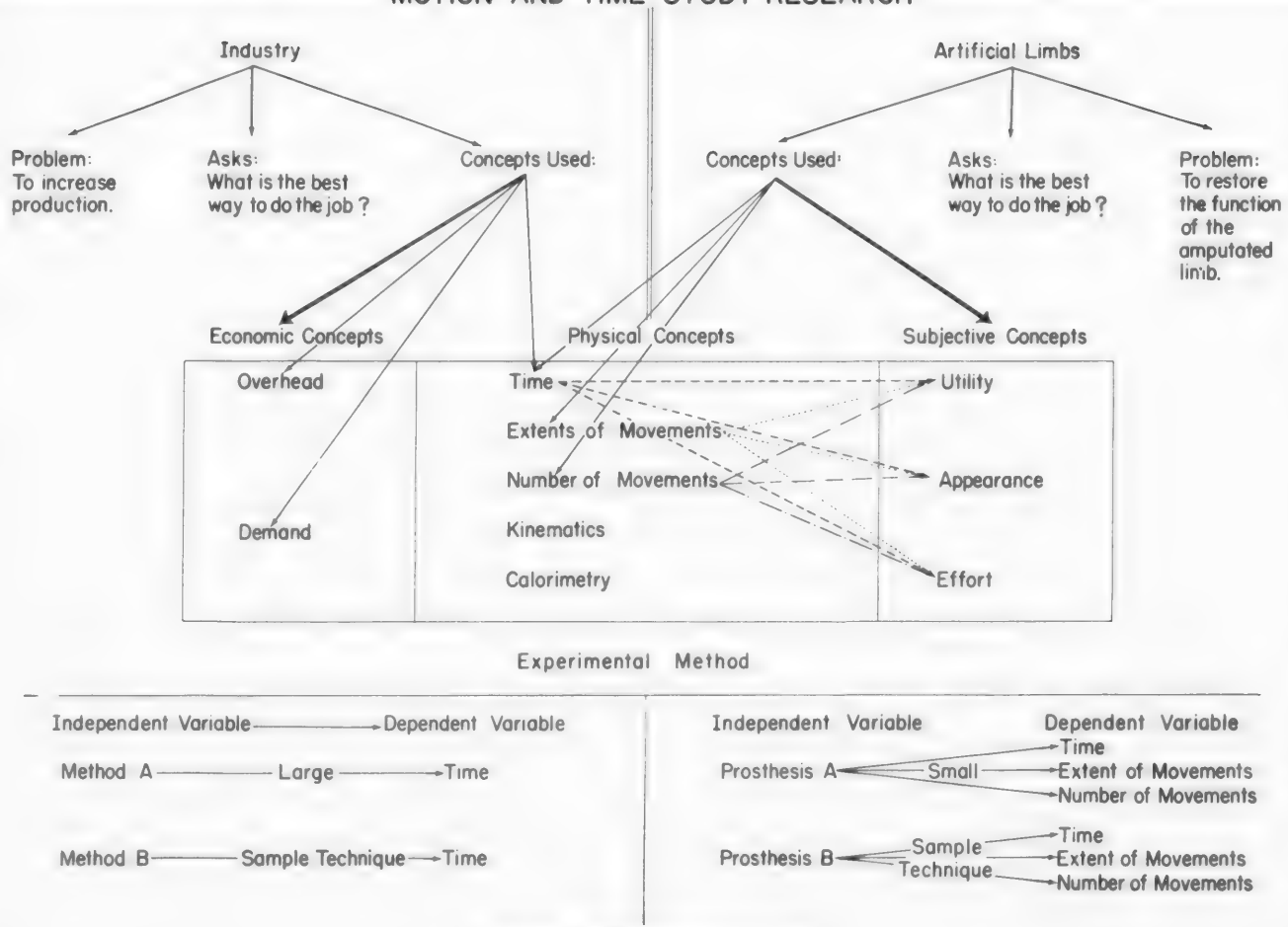


Figure 1. (See text for explanation.)

These physical concepts are the dependent variables of the experimental methods employed. Industrial motion and time study measures the effect on the time to do an assembly job, for example, of Methods A and B. The method which permits the smaller cycle time is the better method. Ideally, large sample techniques are used. The assumption of these techniques is that individual variables will tend to be cancelled out and that the time to do the job will be a function of the method. In artificial limbs research small sample techniques must be used since it is impractical to use many amputee subjects. Therefore extreme attention is paid to the control of extraneous variables which if uncontrolled would introduce spurious results. These variables have been divided into five groups, extra-individual variables, intra-individual variables, inter-individual variables, amputation variables and prosthesis variables.

Figure 2 shows how part of the extra-individual variables are controlled. The positions of the table, stool and subject are kept relatively constant to each other.

The props used for the activities are also kept at constant relative positions as shown in Figure 3. Thirteen activities comprise the evaluation test battery. The amputee wearing prosthesis A is trained in these 13 standard activities and when a plateau of performance is reached, a motion picture record is made of the performance. This procedure is repeated for the amputee wearing prosthesis B.

Figure 4 illustrates the training plateaus obtained by an amputee in the phone sequence. The upper curve is a time curve, showing that the variability in time decreases as a function of the number of trials. Also, the error curve, which is the lower curve, decreases as a function of the number of trials and reaches zero.

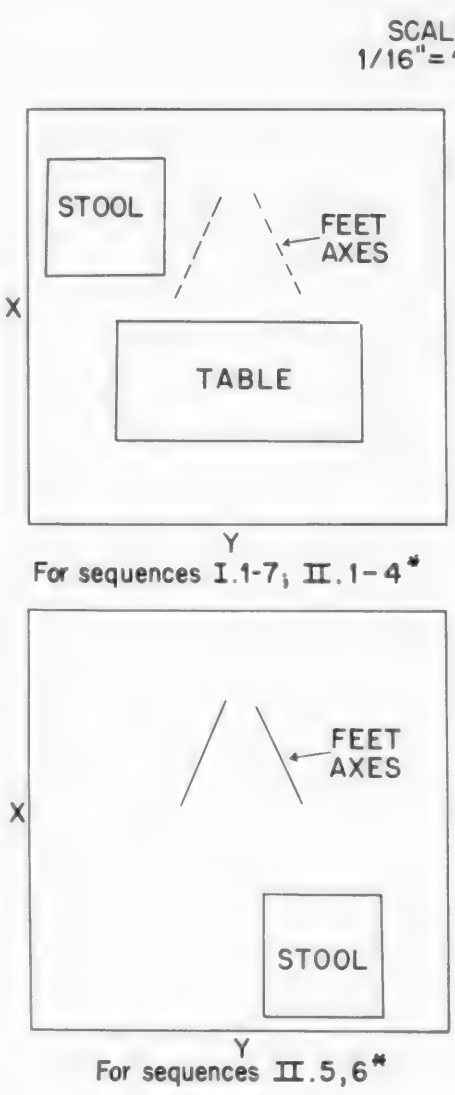


Figure 2. The Grid Floor Plan.

*Refer to Table 3-1. In sequences I.1-7, the stool and feet axes are not used. The seat upon which the subject sits is positioned according to standard position requirements.

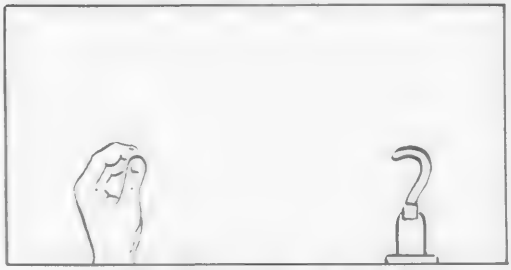
The training plateau has been established to control individual variables. When the plateau is achieved it is hypothesized that the subject is performing in a characteristic fashion, and a motion picture record is made.

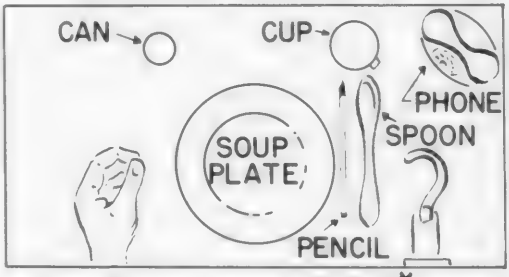
Figure 5 presents a frame of the film as the camera more or less sees it. The camera, a 35mm high speed Mitchell frames the three views that are provided by the grid and an overhead and side mirror. The clock in the upper left can be read to the nearest hundredth of a second. Six 3-tube fluorescent fixtures are positioned about the grid so that enough light is obtained and glare in minimal. Black curtains in the background heighten contrast.

The movie, which is photographed at a speed of 24 frames per second, is analyzed from the 8 inch by 10 inch screen of a variable speed Moviola editing projector. The clock furnishes the analyst with therblig times and the three views furnish the analyst with data from which extents of movements can be recorded.

Figure 6 is a modified Simo-Chart as we use it. A therblig analysis is made for both the right and left sides. In addition the extents of movements for the head (C) segment, torso (T) segment, shoulder (S) segment, arm (A) segment, forearm (F) segment and hand (Ha) segment are estimated in degrees. For each sequence, the number of movements and extents of movements in addition to therblig times are tabulated.

Figure 7 represents a comparison made between three amputees and one non-amputee. The percentage frequency histogram shows that the amputees tend to use a greater relative amount of proximal movement, for example, head, torso and shoulder movement. The non-amputee subject's movement is practically all with the forearm and hand. This result has





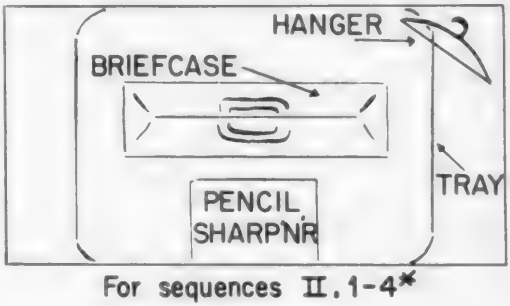


Figure 3. Position of Props on Table for Subject Using Right Arm.

*Refer to Table 3-1. For subject using left arm, a symmetrical pattern to the left is used.

suggested the following principle for evaluation. As the artificial limb improves the amputee wearer will be able to manifest a higher proportion of distal movement.

Conclusion

In conclusion I might mention that besides employing the method presented here for evaluating artificial limbs, we are presently engaged in using the method for fundamental research. We are investigating the following problems:

(1) Is there such a thing as a casual pace for performing everyday activities and can people be trained to work at a casual pace? Dr. Barnes has shown that motion and time engineers can be taught to estimate the pace at which a worker is working. We are trying to determine whether an individual can be taught to work at a standard pace.

(2) What is the range in therblig times for normal subjects when performing everyday living activities?

(3) What is the range in extents and number of movements for normal subjects when performing everyday living activities?

It is hoped that research on these problems will give us design information for artificial limbs of the future.

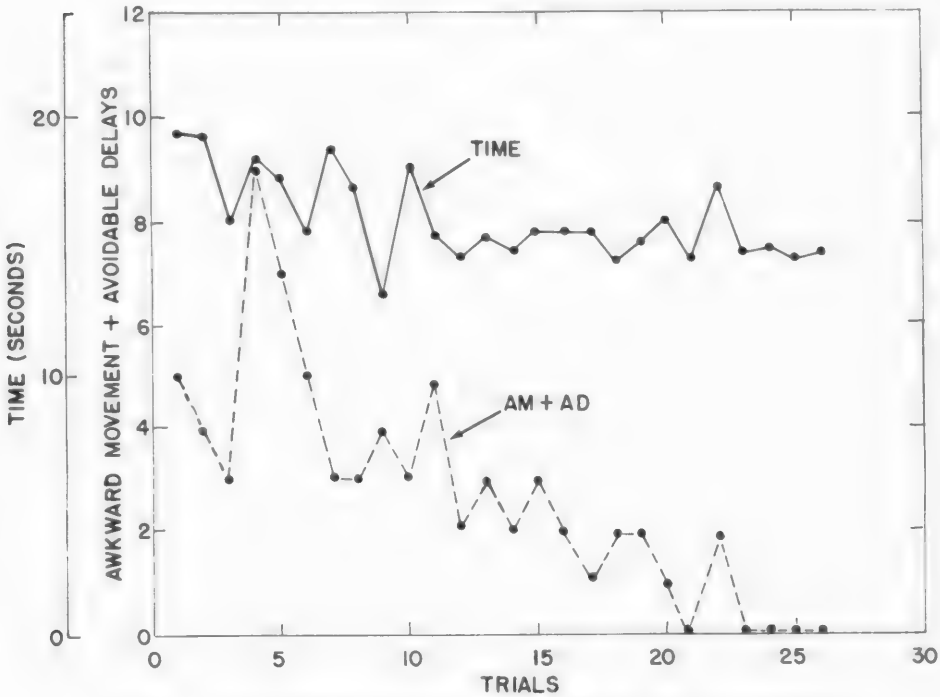


Figure 4. Awkward Movements Plus Avoidable Delays and Time for Subject JL (Phone Sequence)

(Figures 6 and 7 are on page 70)

Figure 5. Image As Camera Sees It.

SUBJECT: LO SIMO CHART SEQUENCE: CUP HARNESS

OBSERVER: MSG

LEFT SIDE THERBLIG & DESCRIPTION	CLOCK TIME	TIME IN SEC	% TOTAL TIME	C	T	S	A	F	Ha	Ha	F	A	S	T	C	% TOTAL TIME	TIME IN SEC	CLOCK TIME	RIGHT SIDE THERBLIG & DESCRIPTION	REMARKS
TE & G RH	5.3					30	8Ø,7Ød	30,35ø	15ø,15c		10	25,20ø	10	5ø	15,5,10ø			5.9	TE, P&H for L H to PP	
PP R H	6.7	8	16.7			15	10	15ø,5	30 25							12.1	1.4	7.3		
TE to S P	7.3	10	20.8			20	8Ø,6Øø	25ø	20 15ø,15c	30ø	1	20,10 5ø	15,15	15ø,10	5	12.9	1.5	7.3	TE to cup	
	8.3					35,35												8.8		S operates hook by opposite shoulder shrug
	8.3					35,35				30c	5	10ø	10	10ø	5	8.6	1.0	8.8	G cup	
											35	30,5ø	35	5ø	20,20			9.8	TL to mouth	
																12.1	1.4	11.2		
														15ø,5	40,20			11.2	u (drink from cup)	
Idle																14.6	1.7	12.9		
											45	50,10ø 30			15ø,5			12.9	TL & P on table	
																8.6	1.0	13.9		
	15.2									30ø				5ø		8.7	1.1	13.9	R L	
TE & G RH	5.2	8	16.7			20	7Ø,5Øø	20,15ø	5,15c	30c	10	10,15 5ø	10,10	10ø,10	20			15.0		
PP RH	16.0	7	14.7			5	5ø	5,5ø	15 20							14.3	1.8	15.0	TE & H for L H to PP	
RL & TE to S P	15.7 16.7 17.6	9	18.7			20	8Ø,5Øø	15ø,25	15ø,15c 20	10		15,10ø	10	10ø,5	5ø,5	5.6	7	16.8 16.8 17.5	TE to S P	
		48				10.25	10 55	12 21	5 13 23	0.4	12.0	6 11	5.15	24.0	9 14	5 12	10	5 14	19.0	11.6

Figure 6. A Modified Simo-Chart.

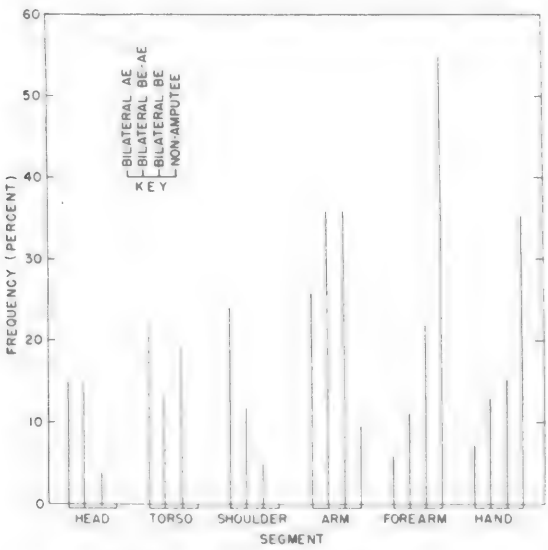


Figure 7. Comparative Segment Motion.

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Diagrams from Wire Masks*

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Introduction

THE addition of white lines to a photograph, such as a superimposed diagram or an arrow indicating some important feature does not present any great difficulty, provided that these are either straight lines or some arc of a circle, in which case they can be drawn with a ruling pen and a straight-edge or a compass. When the diagrams call for more devious and irregular curves it becomes more difficult to render them smoothly and to keep the lines uniform and sharply defined.

Drawing with white ink or reproduction white upon the glossy prints required for engraving is not easy when the lines are long, even when the surface is treated for the purpose. White preparations have a tendency to gush from the pen at the beginning of a stroke and to peter out near the end. Corrections are apt to leave their traces, especially when the print is a large one and is used for exhibition rather than reproduction.

There are several ways of avoiding this. One may first make a matte-surfaced print, draw upon it in white, retouching slips and irregularities and then re-photograph it to make glossy prints; or the drawing may be made on some type of clear plastic sheet which is used as a mask either combined with the negative or better drawn full-scale and combined with the paper on the easel during exposure. While this facilitates the correction of minor flaws and irregularities and also permits duplication, it still does not solve the problem of the long and complicated curve. Building up such curves with the aid of draughtsmen's templates on the surfaces involved is a trying ordeal.

Wire Mask Method

A very effective way of overcoming all these difficulties at once is to construct the required diagram from wire which is laid upon the surface of the paper, like any other mask, during exposure. This is especially practical when it is required to execute a number of different diagrams on several prints of the same picture, since one negative serves for the whole series.

Some time ago it became our problem to illustrate diagramatically the pathways followed by inspiratory air currents passing through the nose, mouth and throat under some six or eight different conditions. One anatomical picture of the region served as the background for all the illustrations, but a different white-line diagram was required for each. The lines were long, the curves complicated, the results sub-standard; much fine coated paper went into the trash can.

Finally wire models were constructed, such as those shown in the figures, which filled all requirements. They proved surprisingly easy to make and to handle.

* Received for publication May 12, 1954.

Figure 1. Shaped wires (left) and three prints. Upper left print was used as a pattern. Upper right and lower prints show result of superimposing the two different wire configurations on paper during print exposure.

To facilitate manipulation (and partly because the prints were to be used for instruction) the prints were made on 16 x 20-in. glossy paper. First a print (upper left, Fig. 1) was made to use as a pattern, laid flat on the table, and the wire was shaped to it.

The wire used was #18 (B & S gauge) copper wire. It must be perfectly straight to begin with to fall into smooth curves when bent. The straightening can be easily done by fastening one end of a 6-8 foot length to a doorknob or other stable object, grasping the other end and stretching the wire very slightly. All but the sharpest kinks will vanish under this treatment. The wire should be cut into approximately the required lengths at once since otherwise handling may develop new kinks.

In laying down the pattern the soft wire can be bent, adjusted and re-adjusted until it is exactly right. (Compare this with the correction of pen-drawn curves which get out of hand.)

If only one line is required the single wire is put in position on the printing paper while the image is projected through the red filter before exposing. If the diagram is more complicated and consists of several crossing or impinging lines time can be saved by applying a small drop of soft solder at the junction. (Fig. 2) To keep the lines properly spaced

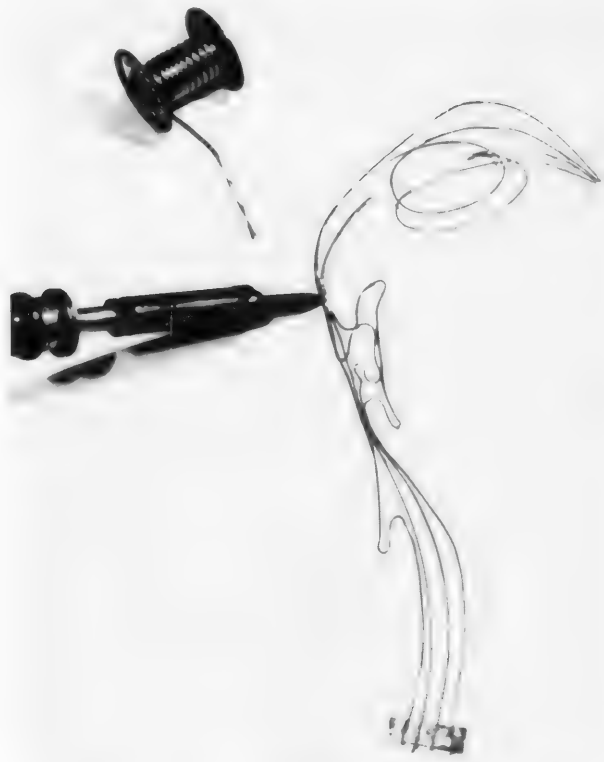

Figure 2. Soldering junctions of complex wire shapes.

the ends of the wires, below, were spot soldered to a small piece of metal which, of course, lies outside the field.

Figure 1 shows the size and scale of the patterns and the ease with which they can be handled. The left upper print in the figure was unaltered; at the upper right is a print made with the upper pattern superimposed; below is one with the lower pattern.

It will be seen that where a long interruption in a line was required (right upper print, Fig. 1) a portion of the wire was simply clipped away. The effect of a dotted or a dashed line is accomplished with India-ink on the print.

For simple straight lines, such as indicator lines running off the print to some type-set comment at the margin, there is available a thin black iron wire, used by florists, in straight, one-foot lengths.

(Confidential aside to anyone who may have gathered the impression that this is only another example of doing something the hard way: each of the patterns illustrated required less than ten minutes to make; the cost, about that of one ruined print.)

Journal of the Biological Photographic Association Vol. 22, No. 2 May, 1954

A Method of Preparing Negative Lantern Slides*

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THE proven superiority of negative lantern slides where simple line data on short-scale film is to be presented, has led to a search for easy methods of making and coloring these slides.

Inasmuch as the original negative is often used later in the making of prints, it seemed practical for us to preserve this negative rather than to bind it between two pieces of glass as is done in many of the medical photographic units. Then too, proper centering of copy on the ground glass for subsequent binding of the film negative often led to problems of alignment and size both at the copy table, or if not entirely successful there, at the binding table with scissors and tape. The time wasted by using a film negative in this way (or the older method of copying directly on to a glass slide and making both positive and negative slides by contact) seemed prohibitive in both cost and time to us. The method described below also allows us to give an unbound positive to the doctor for his use in case the negative slide is damaged:

1.) A copy negative is first made on short-scale film.

2.) After processing, the film is placed in a condenser enlarger and projected on to a glass lantern slide.

3.) This positive slide is developed, fixed, rinsed off and then placed wet in the enlarger and again projected on to a glass slide. (Time and handling is thus saved by fixing and washing both negative and positive slides in one operation.)

A small wooden stand was constructed to hold the unexposed slide during exposure (Fig. 1.). This is placed on the enlarging easel and a non-processed slide painted white, containing a taped down *Ideal* slide mask, is placed on it to determine positioning and focus of the image (Fig. 2.). A piece of graph paper has been attached to this wooden lantern slide holder as a help to the photographer in lining up vertical and horizontal lines on the finished slide. When the lantern slide upon which the exposure is to be made is placed in the same position as the painted slide, correct positioning of the finished product will result. Because we do all of our positive work by projection at Michael Reese Hospital, the next step in making the negative slide from the previously acquired positive is by 1:1 projection. (This could be done just as easily by contact.)

After processing and drying thoroughly, the negative glass slide is now ready for coloring. Colors such as Dr. MAR-

* Received for publication June 25, 1954.

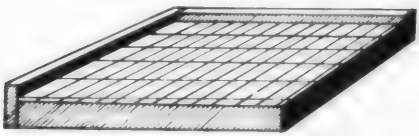

Figure 1. Wooden lantern slide holder showing graph paper.

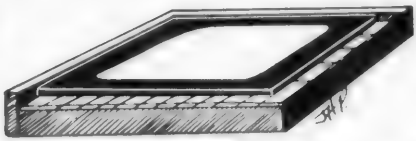

Figure 2. Wooden lantern slide holder with painted and masked focusing slide in place.

TIN'S water colors (manufactured by B. Aronstein, N.Y.) have been used successfully where the thin lines found in short-scale graphs, hand-lettering and typewriting are to be colored. The easiest method is to mix these colors with water and then apply several applications of dilute color with a good sable water color brush, letting the slide dry between applications to fix the color. We have found these colors to work better than ordinary transparent water colors which have a tendency to streak if not very carefully applied.

Attempting to use Dr. MARTIN'S colors on large clear areas such as are found in an ordinary bar or pie graph usually results in uneven patches of colored emulsion; projection only accentuates this uneveness. Bourges *Colotone* can be used for preparing lantern slides having such large clear areas. These transparent sheets can be purchased with or without an adhesive backing in a variety of colors. Large areas on the slide can be quickly covered by cutting the *Colotone* to the approximate desired size (overlapping of color on to the black background will not matter) and placing over the clear area on the emulsion side. If the adhesive variety is used, slight pressure is all that is necessary to make it stick; if the non-adhesive *Colotone* is used, it will be necessary to secure the edges falling within the black area with a bit of tape. Several colors can be used to achieve the desired effect and different colored sheets can be laid one on top of the other to make additional colors.

A little practice in judging cut sizes will be necessary before perfect results are obtained, but the finished results are far superior to any hand-tinted processes these authors are familiar with. In addition, the slightly pebbled surface which shows up on projection is even and interesting.

Pin-holes in the emulsion are opaqued either before or after application of color, whichever is most convenient, and the slide is protected with a cover glass and bound.

Journal of the Biological Photographic Association Vol. 22, No. 2 May, 1954

The Diazotype Process as Utilized at the Armed Forces Institute of Pathology*

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Introduction

To the medical photographer the diazotype process is an unfamiliar method, relegated to the class of blueprinting and allied procedures where it is employed chiefly for the reproduction of engineering and architectural drawings. The diazotype process has largely replaced the old ferrogallic process and the blueprint processes. A growing use of the diazotype process is for reproduction of documents and forms where copies for filing and circulation are necessary.

Tests conducted by the Photography Division of the Medical Illustration Service of the Armed Forces Institute of Pathology, have shown that diazotype process has definite advantages for the rapid production of duplicates of x-ray originals or x-ray copies; lantern slides, both of line work and continuous tone; negative or positive overlays; film strips; transparent or translucent materials for overhead projectors; copies of case histories, correspondence and special subjects for exhibits and reports.

Basic Principles of the Diazotype Process

Briefly, the process is based on light-sensitive aromatic diazo compounds combined with azo coupling components. During printing, the diazo compounds are decomposed in proportion to the amount of radiation in the ultraviolet or near ultraviolet region of the spectrum that penetrates the original material and impinges upon the diazotype material. The decomposition of these compounds prevents subsequent coupling to form a dye.

During the development stage, ammonia fumes pass over the surface of the material, causing coupling with the compounds that have not been decomposed, and a permanent dye image is formed.

The action of light upon diazotype material is the reverse of the more familiar photographic reaction. When light impinges upon a photographic emulsion, the area receiving the greatest amount will show the greatest density. In the diazotype process the area of the material receiving the greatest exposure will have little or no density. This results in the production of a negative from a negative or a positive from a positive.

Diazotype materials may be obtained in a variety of colors and paper weights, including translucent papers, translucent or transparent foils, card stock, plastic treated papers, or cloths, in sepia, blue, black, etc. The storage of this material presents a minor problem, for even when it is stored away from heat, light and ammonia fumes its shelf life is comparatively short — approximately three to six months. After this period the diazotype material produces a fainter image lacking in saturation.

The machine currently used by the Armed Forces Institute of Pathology is the "Ozamatic" desk type copy machine, which can accommodate material up to 16 inches in width and of any desired length. It is 27 inches high, 28½ inches wide and 35½ inches deep and weighs 355 pounds. It operates on a current of twenty amperes at 110 volts.

This machine must be vented to carry the heated ammonia fumes out of the building, and must be grounded to discharge static electricity generated by its moving belts. Since a dark room is not required for this process, the machine may be placed in any area where venting is practicable. A flaw-free glass printing cylinder should be specified when the machine is ordered because inherent flaws, such as bubbles, "bull's eyes," etc., contained in the matrix of the glass cylinder, may be printed on the sensitive foils.

Duplication of X-Rays

The foil recommended for duplication of x-ray films at this time is Ozalid No. 101X. It gives good density and fairly good color. The color varies from a warm black to a violet shade, depending upon the dyes, emulsion number, ammonia temperature and developing time. The principal objection to these foils is the thinness of the base, which is approximately .005 inch. It is difficult

* Received for publication May 14, 1954.

Figures 1 and 2. The original x-ray with a gray scale added, compared to the *Ozalid* duplicate demonstrates increased contrast in the latter. The author has no data on the quality of halftone reproduction obtained from a subject produced by an *Ozalid* foil. Therefore, densitometric readings of the two were made and are shown in Figure 3.

to insert the foils under the retaining fingers on an x-ray view box, and the slightest amount of heat causes them to curl. Efforts are being made to obtain foils with a thicker base, one of .0075 inch, but the demand for this material is so small that the likelihood of its being produced is remote.

The directions that follow are to be used as a guide. They have been derived from experience with the machine currently in use at the AFIP.

1. Set ammonia heating temperature at 180 degrees F.
2. Turn off auxiliary heater.
3. Vary the printing speeds from 4 to 7 feet per minute, depending upon the density of the original material and contrast desired.
4. Pass foils into the developing chamber three times to insure full development.
5. Maintain a rather fast flow of ammonia.

The contrast range of the x-ray duplicates may be controlled and improved by varying the printing speed. The faster the speed (less exposure) the more detail and softness will be obtained, to the point where areas will "block up." The slower the speed of the Ozalid machine (the more exposure)

the more diazo destroyed and the greater the contrast. Comparison of the original x-ray (Fig. 1) and the Ozalid duplicate (Fig. 2) will give an approximation of the detail lost with increased contrast. (There are no data available at this time on the quality of reproduction obtained by the halftone process from a subject produced by an Ozalid view foil. Therefore the densitometric scale has been included (Fig. 3) to show the short end straight line portion of the curve of the reproduction as compared to the original.)

In making diazotype x-ray duplicates the strippers of the Ozalid machine should be set to prevent the foils from reaching the developing chamber automatically. This will enable the operator to place a sheet of porous paper on the emulsion side of the exposed material before development. The porous paper will prevent the foil from becoming scratched when passing over the perforated drum of the development chamber.

The chief advantage of the diazotype process for x-ray duplication is speed, by elimination of the four steps in normal processing: wet developing, fixation, washing and drying to produce an intermediate, and the repetition of these same steps to produce a positive. By actual timing it has been found that an average x-ray can be reproduced in a minute or less, depending on the density of the original. An additional advantage is in the saving of man hours and by elimination of chemicals and films required in the photographic process.

It is the consensus in the AFIP that the duplicate, although not of as excellent quality as the original, is satisfactory for teaching purposes.

While it must be admitted that diazo dyes are somewhat fugitive, the files of the Photography Division hold experimental material made over two years ago, which have not shown any signs of deterioration. On the other hand, Ozalid material which has been kept on a view box for a month, illuminated by fluorescent tubes, has faded badly. It is believed that Ozalid material filed away from light and heat with an occasional viewing will be stable for many years.

There are some disadvantages in the diazotype process as compared to the photographic duplication of x-rays. Not as much control of contrast can be exercised as by the photographic method. The tints of the Ozalid emulsions seem strange when compared with the familiar black and gray tones of an x-ray or its photo duplicate. Thinness of the base of Ozalid material, .005 inch makes it harder to handle than the .0075 inch photographic film.

Lantern Slide Duplication

The Medical Illustration Service maintains lantern slide sets for loan purposes, which are produced in large quantities by the Photography Division. Some of these slides have been duplicated on Ozalid 35mm stock and included in these sets to test their useful life under actual projection use. Slides that have been in use for a year have shown no signs of deterioration.

The following method is employed for the production of these slides: A master film strip that has a long scale of gradation is made, one that would be considered photographically soft. The master film strip is exposed on Ozalid 35 mm type M dry duplicating film in the same manner as the x-ray duplicate. The projection quality of slides so produced is very high because of the transparency of the dye image, especially in dense areas, so that even in shadows the detail is preserved.

The cost of producing these slides is less than one-third of the cost of comparable 35 mm lantern slides by the photographic method.

Direct lantern slides from color film may be made by utilizing the original color film and the 101X material in the same way that the master film is used.

Too often the appearance of a good series of lantern slides, consisting of clinical and typewritten material, is detracted from by inclusion of a radio-matt type of slide. Finer slides of a quality far superior to the matts now in use can be produced "while you wait." These slides are positives with the printed material in green, violet, warm brown, and sepia. Lantern slides of this type are produced as follows:

1. Use Ozatran Master paper or a transparent drawing paper without a definite grain or water mark.
2. Back the paper with Old Town Stratosphere orange carbon paper. (A fresh black carbon can be used, but is likely to smear.)
3. Type in the data within the area that corresponds to the dimensions of the lantern slide matt.
4. Feed the master paper through the Ozalid machine with a foil of the de-

sired color: trim and bind into a lantern slide.

5. Foils printed in different colors can be combined into one slide.

Other Uses of Ozalid Reproductions

By means of foils, overlays may be placed on drawings, charts, photographs, and lantern slides in black and white or color, depending upon the choice of foil. Captions on photographs, transparencies, etc., may be made by the same method as that recommended for lantern slides of typewritten material (Fig. 4).

Covers for reports, copies of case histories and charts may be run on sensitized paper in various colors more cheaply than they can be reproduced by photographic means.

While the diazotype process as it is used today is effective on translucent originals which are printed on one side of the paper only, it may be used in conjunction with photographic negatives, positives, or a photostat machine. With Photostat paper grade W, or Haloid paper grade T, used in the camera, a photo copy of the two slides of a sheet can be made and run through on the Ozalid machine when the number of copies warrant. It is estimated that an 8½ inch photo copy will cost 10 cents, while the cost of the Ozalid is 1½ cents. (Reflex photocopy paper may also be used for reproduction of material printed on both sides of the page: after it is processed it can be used as a master on the Ozalid machine.)

The diazotype process can be utilized for general office work where duplication of letters, forms, etc., is required, or on material especially prepared for the process. The mimeograph process is much cheaper and faster when 25 or more copies are needed: but when a small number is required, the diazotype process can provide duplicates of a finer quality much more cheaply because no stencil is needed.

Frequent requests are received for a rush print from a color transparency. This normally would require copying the transparency on panchromatic film, processing and drying the negative, then printing and processing and drying the print. With Ozalid material a sepia toned paper print can be produced directly from either the black and white positive or the color transparency. This can, in turn, be reproduced by the halftone process, or employed for any purpose that is generally served by a photographic print

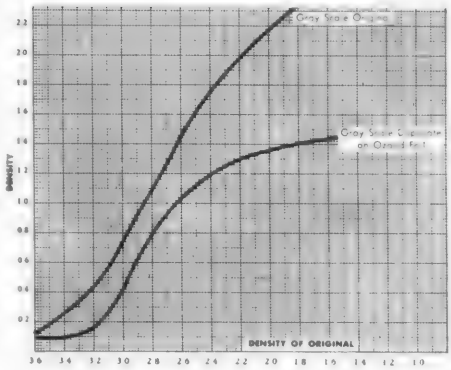


Figure 3. Densitometric readings of original x-ray and *Ozalid* duplicate.

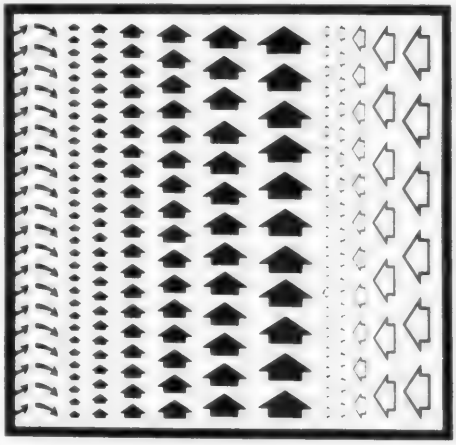


Figure 4. An *Ozalid* copy of an *Artype* group of arrows that are used as overlays.

Summary

The diazotype process, whether by the use of the machine, the vacuum frame, or the vaporizing chamber, can play a very important part in expediting the output of material in a laboratory where copies of x-rays, lantern slides and photostatic copies are required in great numbers.

BOOK REVIEWS

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, *1954, Henry Greenwood & Co., Ltd. (available through photographic dealers), 620 pages, illustrated, 5 inches x 7½ inches. Paper bound $2.00, cloth $2.50.*

The 1954 issue of the BJ Photographic Almanac represents the 95th year in which this famous annual has appeared. It contains a number of articles, some of a general nature, and others of a more technical nature, in addition to 32 photogravure reproductions in the pictorial section. There is the usual review of equipment introduced and papers published during the previous year, a chemical glossary section, an extensive formulary and an optics section. A useful compilation of color materials for still photography is placed in the annual for the first time, plus other data on black-and-white sensitized products.

The editors have written a most interesting article on the historical development of photography under the heading "The Seven Ages of Photography". Mr. George Ashton is the author of an article entitled "Evaluating Color Quality on Tripack Materials" that is well worth reading by those who want a more technical appreciation of modern type color materials. The third article which met this reviewer's eye particularly is one by Keith M. Hornsby entitled "Masking In Multilayer Materials". Although the treatment is non-technical, the manner in which the author explains the functions of masks is clearly and accurately stated.

ADVANCES IN ELECTRONICS, *Vol. 5, edited by L. Marton, Academic Press, Inc., 125 E. 23rd St., New York 10, N.Y., 420 pages, (1953), 6¼ in. x 9¼ in., $5.00.*

This volume of *Advances in Electronics* maintains the usual high technical standard of the previous volumes. Nine leading authorities contributed chapters to the current volume. Only two chapters have a direct interest for those engaged in technical photography. The first of these is entitled "Performance of Detectors for Visible and Infrared Radiation" by R. Clark Jones of the Polaroid Corporation Research Laboratory. He gives interesting comparative data for various detectors, including photo-conductive cells, photographic materials, and the human eye. The other chapter is entitled "A Review of Recent Work In Color Television" by Charles J. Hirsch of the Hazeltine Corporation Research Division. This is a very thorough chapter, nicely illustrated.

The book also contains a cumulative index for volumes 1 through 5.

THE SCIENCE OF PHYSICS IN LITHOGRAPHY, *Erwin Jaffe, Lithographic Technical Foundation, Inc., 131 E. 39th St., New York 16, N.Y., 139 pages, (1953), 5½ in. x 8½ in., $12.00.*

Although this book is far over priced it will prove of considerable help to photographers who have not had a formal education in physics. The subject is very simply presented and each chapter is profusely illustrated. The chapters on heat and temperature, heat transfer, electricity, electric circuits, light and illumination, reflection, refraction and lenses, the eye and optical instruments, and light and color, will be of greatest interest to people engaged in photography. The formula section gives many useful and practical relationships of various physical constants and dimensions.

TOXICITY OF INDUSTRIAL ORGANIC SOLVENTS — *Preventive Measures for and the Treatment of Industrial Poisoning, E. Browning, Chemical Publishing Company, Inc., 212 Fifth Ave., New York, N.Y., 411 pages, 6¼ in. x 9¼ in., (1953), cloth bound, $8.00.*

Although photographers are not generally concerned with toxic chemicals, they do use a number of items that can produce pronounced toxic symptoms, and even cause serious difficulties if the symptoms are not recognized. Of course, it is better to be aware of the toxicity of the compounds used rather than waiting for the appearance of symptoms. For example, if a

photographer knows that carbon tetrachloride can cause acute poisoning leading to lesions of the liver and kidneys, etc., he will not close himself away in a small darkroom to clean a group of negatives or perform some other operation where carbon tetrachloride is involved. There are many other frequently used hydrocarbons that are not normally looked upon as poisons which can produce strong toxic reactions. This book deals with nearly every type of solvent that the photographer is apt to use and so it forms a useful reference for the photographic laboratory.

Each chapter is unusually well referenced. As a matter of fact, about the only thing that one can criticize about the volume is its fairly high price.

PRINTING WITH VARIGAM, *M. Richard Marx, Camera Craft Publishing Co., 95 Minna St., San Francisco, Calif., 80 pages, illustrated, 5¾ in. x 8½ in. (1954), paper bound, $1.95.*

The first part of this book, entitled The Evolution of "Varigam", was written by the co-inventor of this variable contrast paper, Dr. Rowland S. Potter. He reviews briefly the history of variable contrast papers from the days of Rudolph Fischer 40 years ago to the present, but does not mention the contributions of Ilford, Ltd. in England who introduced their Multigrade prior to Varigam. The remainder of the book is written along the "how-to-do-it" vein. There are 12 chapters which discuss the general advantages and disadvantages of Varigam, necessary equipment, exposure determination, negative contrast estimation, straight printing with Varigam, uses of contrast for pictorial emphasis, effects of local variations of exposure or contrast, advanced printing techniques, toning Varigam, and finally a one page chapter on the physical characteristics of the paper. The book is excellently printed, easy to read and fully illustrated.

LABORATORY INSTRUMENTS, *Their Design and Application, A. Elliott, and J. Home Dickson, Chemical Publishing Company, Inc., 212 Fifth Ave., New York, N.Y., 414 pages, illustrated, 5¾ in. x 8¾ in., (1953), cloth bound, $7.50.*

Many laboratory workers make use of instruments without knowing much about their design and the difficulties that are encountered to obtain proper functioning characteristics. On the other hand, there are occasions when laboratory workers find it necessary to construct a special piece of equipment for a particular job and are faced with learning the hard way what qualified instrument makers have long since known. This book should be a welcome addition to either category of worker since it covers the subject sufficiently to enable one to employ accepted principles in designing equipment and certainly includes enough data to show how many considerations must be made to produce instruments with minimum errors.

To photographers the chapters from 12 to 16 will be of particular interest. These chapters are entitled, respectively, "Glass," "The Working of Glass," "Lens, Mirrors and Prisms," "Optical Instruments," and "Photography In Research".

Numerous references are given throughout the book, as well as a thorough Index. A short chapter (Appendix III) on raytracing should be helpful to the technically minded person who has had no previous experience in this field.

A GUIDE TO MEDICAL AND DENTAL PHOTOGRAPHY, *Kenneth S. Tydings, Modern Camera Guide Series, Greenberg Publisher, New York, N.Y., 124 pages (1953), illustrated, 5 x 7¾ in., $1.95.*

The growing literature on photography as applied to medicine has been augmented by this comprehensive little manual which in its 124 pages covers the rationale of photography in medicine and offers specific recommendations for many of the situations routinely encountered in medical photography. Intended for the physician, the aim has been to simplify the variables so that the necessary technics may be readily mastered for office use.

The manual contains a careful presentation of the basic requirements for patient photography: preparation, positioning, lighting, backgrounds, and so forth. Chapters on copying (both opaque materials and x-rays), macro and microphotography offer adequate data for color and black-and-white films, as well as requirements and data for such fields as infrared, ultraviolet photography and fluorography.

A necessary minimum of photographic theory, and information on films, filters and

light sources, is included. Small cameras, particularly the 35mm, and the use of color films and the convenience of speedlight as a most satisfactory light source, is emphasized. Medical photographers, both old and new, should find it helpful, and factual.

S. J. McComb

THE THEORY OF THE PHOTOGRAPHIC PROCESS, *Revised Edition, C. E. Kenneth Mees and Collaborators, The Macmillan Company, 60 Fifth Ave., New York 11, N.Y., 1133 pages (1954), 6½ in. x 9¼ in., cloth bound, $21.50.*

The long awaited second edition of Mees' classical treatise on the theory of the photographic process was received just before this number of JBPA was ready for the press. Your Editor cleared enough space to at least describe the book, even though there was not time to prepare a critical and detailed review. However, a three-hour examination of the contents indicates that there would be little that one could find to criticize adversely.

The entire book has been reset in a more interesting and readable type than the original 1942 edition. This was made possible by the fact that the revision was not merely a matter of entering corrections here and there and adding occasional paragraphs to bring the book up to date. It has been largely rewritten, showing that the progress in the theory of photography has been so extensive since 1942 that the earlier volume could function in no way other than as a framework for the new book. The order of presentation and contents have been changed. There is a new chapter on the action of charged particles on photographic emulsions, another on the latent image produced by X-rays, and still another on the sensitometry of color films and papers. To make room for this new material it was necessary to omit the chapter contained in the first edition on the photographic aspects of sound recording, and also much of the historical material.

It is a pleasure to see that in the new edition the editors of the various sections and the individual authors of chapters are not hidden away in the preface, but rather are listed in the table of contents. In spite of this innovation, it is likely that references to the book will continued to be abbreviated to "Mees", to whom the major credit for the existence of the volume is due.

Part I is entitled "The Photographic Material" and J. A. Leermakers was the general editor. It contains three chapters, namely, "The Light Sensitive Material" by H. Baines and R. Stauffer: "The Size of the Silver Halide Grains" by R. P. Loveland: "The Preparation and Properties of Gelatin" by J. Russell.

Part II is on the "Action of Radiation", edited by J. H. Webb, who also wrote some of the chapters. This part deals with the sensitivity of silver halide grains, relation between exposure and developed density, reciprocity and other effects, solarization, action of charged particles on emulsions and the latent image produced by X-rays. The authors (W. F. Berg, J. H. Webb, P. C. Burton, G. Kornfeld, G. W. W. Stevens) are all recognized authorities in photographic theory.

Part III, entitled "Optical Sensitizing" was edited jointly by B. H. Carroll and L. M. S. Brooker. It has three chapters, all of which either Carroll or Brooker had a hand in. These chapters concern spectral sensitivity, sensitizing and desensitizing dyes, and the mechanism of optical sensitizing.

Part IV, edited by T. H. James and A. Weissberger, is called "Development and the After-Processes". James and Weissberger wrote all but two of six chapters in this part, these two coming from H. Baines and A. Marriage of Kodak, Ltd. The development mechanism, the developing agents, the kinetics of development and the electrochemistry of developers appear to be very thorough, whereas the chapters on fixing and washing, and reduction, intensification and toning seem a bit skimpy.

The final part of the book (Part V) was edited by the late L. A. Jones who died shortly before the book appeared. It contains seven chapters which probably represent the most useful chapters for working photographers. J. L. Tupper, K. S. Weaver, C. N. Nelson, G. C. Higgins and F. Williams, all familiar names in the scientific photographic literature, were the authors.

The book also has a complete list of journals to identify them according to the abbreviations employed in the very extensive bibliographies at the end of each chapter. The author and subject indexes seem to be unusually complete, also.

New Products

SPECULUM SPEEDLIGHT

The Medical, Dental, Scientific Photographic Equipment Co., 101 W. 31st Street, New York, N.Y., have supplied data to us on a most remarkable piece of equipment for medical photography, as is evident from the following quotations taken from their news release.

"Speculum Speedlight was invented to take guesswork and painstaking focussing (sic) out of closeup photography for physicians, surgeons, and dentists working in body cavities. It gives accurate color reproduction of ear, rectum, vagina and oral conditions with previously unattainable ease and in a matter of seconds."

"Speculum Speedlight does away with old-

fashioned lighting set-ups. Instead of cumbersome floods it uses a one-inch ring light of great intensity and of adequate brilliance for perfect color work. The flash duration, 1/1000 of a second, freezes action so that there is no blur. Quick or rapid breathing and rapid pulsing or tissue movement are arrested by the flash in sharp image."

"It has been found utterly reliable."

"It is so rigged that a child could operate it. No photographic skill is required."

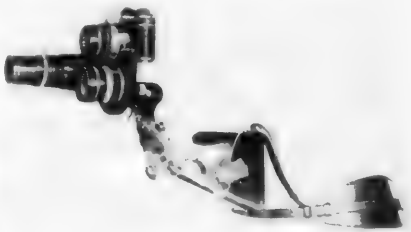
"The light perfectly illuminates the chosen field, through the speculum — with shadowless, perfectly-balanced intensity bound to produce flawless color slides in the finest detail."

CLINGTITE TITLE LETTERS

Clingtite Products, Inc., 4844 S. Ashland Avenue, Chicago 9, Ill. have a 6-page booklet that contains suggestions on when and how to use titles, plus a number of ideas on how titles can be made with professional effects. It describes how titles can be taken on location with the subject as a background, how to make suspending titles that give a "third-dimensional effect", fade-out titles, etc. The booklet is available with samples of self-sticking Clingtite Letters without charge.

RECTAFLEX 3-LENS TURRET MODEL

Director Products Corporation, 570 Fifth Ave., New York 16, N.Y., are now distributing a 3-lens turrent model of the Rectaflex camera which is claimed to be the first still camera of this type. A normal, a telephoto, and a wide angle lens are provided. With each lens, posi-



tive focusing and framing are directly matched through the Rectaflex eye-level ground glass viewing system. Therefore, no accessory viewfinder is needed.

The unit has a hand grip with a trigger for shutter release and a rifle butt which can be attached in place of the hand grip. Further data and prices can be obtained from the distributor.

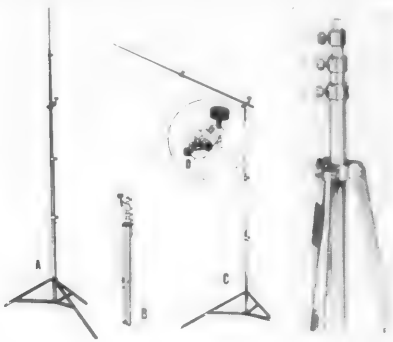
CARL ZEISS STATUS IN GERMANY

Carl Zeiss, Inc., 485 Fifth Ave., New York 17, N.Y., reports the following concerning the status of Zeiss in Germany; The Carl Zeiss factory at Jena was founded in 1846. During 1889 Professor Abbe, then its sole owner, created the Carl Zeiss foundation and turned over all his property to it. When, after World War II, Jena, and that section of Germany, came under the Soviet regime, the new communistic government of East Germany took away all Zeiss property without any compensation, and changed the name of the firm to "Optik Carl Zeiss Veb" (property owned by the People). This sovietiza-

tion had grave consequences for the industrial organization, as well as for the employee-employer relations, of Zeiss in the Eastern Zone. After the conclusion of World War II in 1945, all members of the Board of Management of Carl Zeiss and of the Carl Zeiss foundation, together with many scientists, members of the engineering staff and technical specialists were evacuated from Jena by the United States Army. They were brought to Western Germany in the United States Zone, with permission to start a new Zeiss factory. This was done. The new Zeiss Works in Oberkochen operated first under the name of "Zeiss Opton". Since October, 1953, it has borne the name "Carl Zeiss". As in former years, it is a part of the Carl Zeiss Foundation which is now domiciled in West Germany. All products imported and distributed and sold by Carl Zeiss, Inc., New York, are manufactured in West Germany.

PIC STANDARD AND BOOM-LITE STANDS

The American Photographic Instrument Co., Inc., 241 W. 27th Street, New York 1, N.Y., have two new light stands, namely, the PIC Standard Stand and the PIC Boom-Lite Stand. The first



is a four section, portable aluminum stand for general use. The second is a five section, anodized Duraluminum stand with a self-contained boom, intended for professional applications. Price of the Standard model is $9.95, and the Boom-Lite model, $29.95.

NEW STEREO CAMERA INTRODUCED BY KODAK

Kodak's long-awaited new stereo camera was shown March 15 at the Master Photo Dealer and Finisher's Association annual convention. It is not, however, scheduled for delivery before summer. It was reported that it will be priced at "under $100". The camera has matched 35mm focal length Kodak Anaston Lenses, f/3.5. Both lenses are color corrected,

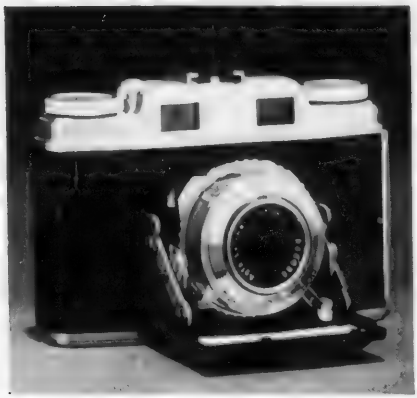
coupled for dual focusing, and "Lumenized" with Kodak's extra hard surface coating. It is also equipped with a new type Kodak shutter, with coupled blade action, having four speeds (from 1/25 to 1/200 second) plus provision for "bulb" exposures, plus built-in flash synchonization. The camera also has a built-in Exposure Calculator which, after the picture taker selects his desired shutter speed, automatically sets the proper lens opening for "bright", "hazy", or "cloudy-bright" lighting.

PRODUCT LITERATURE NOTICE

C. A. Brinkman and Co., formerly Gamma Scientific Company, P.O. Box 532, Great Neck, L.I., N.Y. have just advised that they have complete descriptive literature available on several of their new instruments. The "Microphot I", for example, a photocell exposure determining device especially recomended for photomicrography will be of interest to many biological photographers. Also, the new IPSCA camera back for 35mm photomicrography has many features for the bio-photographer.

NEW NAME FOR AN OLD COMPANY

An eighty year old youngster now has a new name: Effective July 1 the James H. Smith & Sons Corporation of Griffith, Indiana will be known as the SMITH-VICTOR CORPORATION. The new trademark, SMITH-VICTOR, has also been adopted in order to obtain a closer tie-in with the trade name "VICTOR" under which the company's line of photo lighting equipment has been sold.



ANSCO NEW CAMERAS NOW AVAILABLE

Ansco made an advance announcement of four new additions to their camera line earlier this year, for release to the market later in the year. These cameras have recently been made available.

The Ansco Super Speedex is said to be the world's first fully automatic loading luxury folding camera. The film positions itself for the first (and all other) exposures automatically. There is no red window to watch. It gives twelve full 2¼" x 2¼" negatives on eight-exposure 120 size roll film. The camera incorporates a fully automatic double-exposure preventer. A lock protects the camera lens against accidental damage when camera is being closed since the camera bed will not close unless the lens is in the proper position. The lens and shutter are both ring-set. Once set, they stay set and will not move out of position accidentally.

The Super Speedex has a new hard-coated color-corrected f/3.5 Agfa Solinar four-element anastigmat lens. The camera's Synchro-Compur shutter has speeds up to 1/500th. It is M-X synchronized for all flashlamps and electronic flash tubes at all shutter speeds. It has a wide base optical distance meter coupled to the camera lens and combined with the viewfinder. A brilliant target in the center of the field of view permits exact focusing even in poor light. Price $134.50. Carrying case $9.75 and flash unit $8.95.

The Ansco Super Regent is a new 35mm coupled-rangefinder miniature. It is said to incorporate features heretofore unavailable in a camera in its price range. It has a

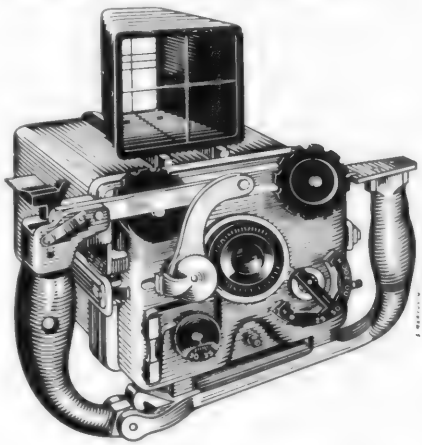
new highly corrected four-element f/3.5 Agfa Solinar anastigmat lens, a high-speed Synchro-Compur shutter, a coincidence type range-finder, and is built of metal throughout. The shutter is the renowned Synchro-Compur with nine speeds from one to 1/500th second, plus bulb, plus M-X synchronization. Price $89.50. Carrying case is priced at $9.75, the flash unit at $8.95.

The Ansco Memar Camera contains the important basic features of a good miniature camera and sells for only $42.50. One of the camera's features is a new, handy and fast-acting thumb-lever film transport. This device automatically advances the film, sets the exposure counter, actuates the double-exposure preventer and sets the shutter for the next picture. Another mechanical feature is a twin-sprocket film drive for smoother, more positive film advance. Two sprockets, instead of the customary one sprocket, take up the film's twin perforations at both top and bottom to advance the film evenly without jamming, binding or tearing. It has an f/3.5 Agfa Apotar anastigmat lens, hardcoated and color corrected. The 1/200 second Pronto shutter is synchronized for flash. A built-in film-type index dial tells what kind of film is in the camera. An optical eye-level subject finder, built-in accessory clip, and hinged back for easiest film loading and removal are also part of the camera design. It is made of metal throughout. Price of carrying case, $6.95; flash unit $8.95.

The new Anscoflex, a popular-priced reflex camera, is stated to be the first significant departure from standard camera design in many years. Its color scheme is two-tone gray and silver, departing from the standard black. It has a new style sliding front panel which protects the two front lenses when the camera is not in use. Also new is a folding light shield for the viewing lens atop the camera. The sliding lens panel and the viewing hood are inter-connected so that one quick motion opens or closes both the lens cover and the finder hood. An unusually large and easier-to-use film winding knob is recessed in the camera body. The camer has a synchronized shutter for flash pictures; a lock-on flash attachment; a new-type shutter lock to prevent double exposures; hinged back, and swing-out supply spool carrier for easier film loading or removal. The Anscoflex uses 620 size roll film and gives twelve 2¼" x 2¼" pictures per roll. Price $15.95. Carrying case, $3.50, and flash unit $4.95.

FENJOHN UNDERWATER STILL CAMERA

Fenjohn Underwater Photo and Equipment Company, 90 Cricket Ave., Ardmore, Pa., have announced a new still camera called the Fen-



john Goggler. All controls — aperture, speed, film advance, focus, trigger and filter change — are available to the diver. It uses 120 or special 70mm films. Up to 45 pictures can be taken on 70mm film in one dive. The image size is 2¼ in x 2¼ in. Price $675.00.

NEW KODAK STEREO VIEWERS

Two models of a new Kodaslide Stereo Viewer were recently announced by the Eastman Kodak Company. Engineered to provide

maximum viewing comfort and ease of handling, both models will take all standard 1⅝ in. x 4 in. stereo mounts. Both models are equipped

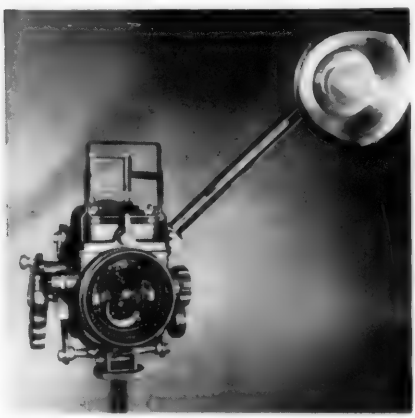
with interocular adjustment, and positive focus control wherein the slideholder rather than the eyepiece moves — thus eliminating the possibility that the focus may be jarred accidentally.

The Kodaslide Stereo Viewer I is a flashlight battery powered unit with single element viewing lenses which is priced at only $12.75. The Kodaslide Stereo Viewer II with color corrected achromatic lenses, priced at $23.75, operates on standard electric power, 110-volt, AC or DC. Model II is equipped with an integral brightness control rheostat to dim or brighten the light to meet the needs of particular subjects, and is supplied complete with lamp and 8-ft. cord. It can quickly be converted to battery powered operation if desired.

The Kodaslide Stereo Viewer, Model I, may also be converted to 110-volt operation, if desired, with a Kodaslide Stereo Viewer Converter ($5.95) which includes bulb, socket, cord, and brightness control rheostat. All components of the converter fit inside the viewer case.

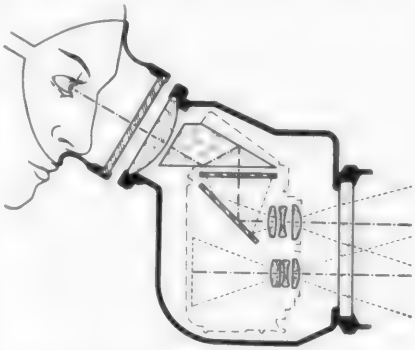
UNDERWATER HOUSING FOR ROLLEIFLEX CAMERA

A factory made, water-tight, pressure-proof housing has been devised by Franke & Heidecke, makers of the Rollei, and it will be available soon through regular photo deal-



ers. Known as the Rolleimarin the new housing is designed for use with any Rolleiflex Automat f/3.5.

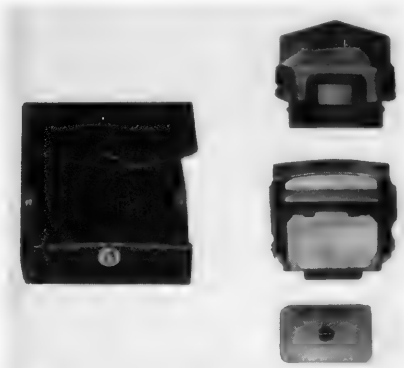
The camera is attached, with the rear portion of the hood removed, to the upper section of the housing, directly beneath a prism. The angle of viewing the ground glass is thus changed — 60° — so that a swimmer can handle the camera while maintaining his normal, 30° swimming attitude. The photographer thus need not change his natural swim-



ming habits when using the Rolleimarin. Coupling of the camera crank with the outside crank (connecting mechanism of which is located in a special absolutely water and pressure-proof chamber) is done when the Rolleiflex is lowered into the bottom part of the housing. For full details write Burleigh Brooks, Inc., 10 W. 46th St., New York 36, N.Y.

NEW LOW COST PRISM FINDER FOR EXAKTA

Just imported from Germany by the Kine Camera Co., 11 West 20th St., New York 11, N.Y. is a precision prism finder for Exakta, plus



a split image finder both in a leather, velvet lined case. Price approximately $70.00. The split image finder can now be purchased alone at a price of approximately $28.00.

Your Association

A section of the Journal devoted to official announcements, chapter events, and other matters of historical significance to the Association.

CHAPTER NEWS

L. B. Brown, Chairman, Chapters Committee

Boston: The "Bean and the Cod Chapter" wound up their season with two excellent speakers. On March 30 Dr. Betty Geren of the Cancer Research Foundation, pioneer worker with the electron microscope, demonstrated the intricacies of this venerable piece of equipment with emphasis on its optical and photographic problems. Three cheers to Dr. Geren for clarifying a most complicated subject.

On May 25 Dr. Donald Donaldson (Fig. 1) of the Massachusetts Eye and Ear Infirmary brought us up to date on developments in

Dr. Donaldson explains the intricacies of his Macro-Stereo Camera. *Left to right:* David Feigenbaum, Laurence B. Brown, Felix Dine, Dr. Donaldson, Cleon E. Babcock.

stereo-macrophotography. Dr. Donaldson builds all his own equipment and the combined mechanical, photographic and medical skills really produces results.

Chicago: Bell and Howell were hosts to the Chicago Chapter at their April meeting. Members of the staff spoke on "Practical Aspects of Magnetic Recording", "Cinemascope in 16mm" and "Service Tips—Cameras and Projectors".

In May, Mr. James Glaze of the Photographic Department of Billings Hospital introduced a new aspect into the usual technical program. He discussed "Modern Thoughts on Color from the view point of the Physicist, Physiologist and Psychologist".

The final meeting of the season was held at the Michael Reese Hospital where there is a newly established department of Medical Art, Photography and Visual Education. Louis and June Pedigo who head this department were hosts. The technique and application of Flexichrome to medical illustration was discussed.

Mid South: This Chapter held its First Anniversary Meeting on April 24. There was an election at which Alex Gravesen was re-elected President, Homer Jones became Vice-President and Peter B. Werner Secretary-Treasurer. This chapter reports an increase of 50% in membership over last year, with Tennessee, Mississippi, Arkansas and Alabama being represented at the meeting. Certification was discussed at great length and unanimously approved, as was the buffet supper served after the meeting by Mrs. Gravesen at their home.

New York: In April Mr. J. J. Kuscher of the Beseler Co. demonstrated the new and revolutionary Beseler Enlarger. Mr. William Perett of Ansco gave an enlightening talk on the use of Printon in the camera as well as some useful information on color duplication. New Officers of this chapter are: Robert D. Wolf, Chairman; Nathan Kantor, Vice-Chairman; Eleanor Moreland, Secretary; Alfred Spitzer, Treasurer; Percy W. Brooks, Sidney Shapiro, Roman Vishniac and David Lubin, Directors.

In June there was a field trip to the Laboratories of Robert Crandell Associates, well known in the field of color photography, processing and duplicating. An excellent folio on color photography techniques was given to everyone present.

Rochester: On April 20 David Lurie presented a talk and demonstration on "Photography of the Eye Using the Slit Lamp". For some time pictures of gross specimens and of patients as well as copies of x-rays have been made with this apparatus. Only recently, however, have attempts been made to combine the two in both black and white and color. An expansion of this idea, with resulting increased illustrative value, was demonstrated by Martha Brunnings' presentation "Various Combinations of X-rays and Medical Specimens".

It was with great regret that we learned of the death of Charlie Foster on May 10th. We shall all miss him.

Southern California: Two spring meetings were devoted to the various techniques of color printing. In April Mr. Jack Whiting of Tricolor Laboratories spoke on direct color printing, dye transfer, and duplication of films. In June Dr. Bela Gaspar discussed the Gaspar Color Printing Process and how it adapts itself to biological photography. (This arouses our curiosity — So. Cal.— how about a resume for the next issue of the journal?)

The May meeting was a double feature at which Dr. Arnold discussed the outstanding film "Embryology of the Eye" (a Sturgis-Grant Production, incidentally) and Avis Gregersen led a slide session revealing new ways of presenting visual material by lantern slides. (This we would like to know about, also.) Election was held and the roster now reads as follows: President — Tom Masterson, Treasurer — W. L. Martinson, Recording Secretary — Julia Owen, Corresponding Secretary — Avis Gregersen, Program Chairman Lewis and Zane Price.

Upper Mid West: This Chapter held an Annual Meeting on June 5-6 at the State University of Iowa, Iowa City. The program, held at the Visual Education Center included a discussion and demonstration of visual education techniques and materials, a motion picture from the V. A. Hospital in Iowa City, a discussion of medical illustration methods for preparation of books and pamphlets, and a question and answer period. This program was dovetailed into that of the Iowa News Photography Short Course sponsored by the University of Iowa School of Journalism. A business meeting and a dinner with the Press Photographers wound up what sounds to us like a very interesing session.

West Virginia: The Sixth Annual Meeting of this Chapter was held at Alderson-Braoddus College on April 23-24. There was a wide variety of subjects discussed which included "The Flexichrome Process"; color stereo slides on biological subjects; and microphotography. There were four salons on exhibit: Photography Magazine Salon, National Scholastic Press Association Salon, India Exhibit from the P.S.A., and National B.P.A. Exhibit.

Birth Notice: A hearty welcome to the newly formed Central Indiana Chapter with headquarters in Indianapolis. Their officers are as follows: Chairman — Robert F. Albright, Vice-Chairman — George P. Cave, Secretary — Dorothy Brower, Treasurer — Richard C. Scott, Executive Committee Member — Morris J. Pickett. I am certain that we will have some interesting news from our newest chapter in the near future.

Deaths of Two Chapter Leaders

Reference has already been made to the sudden and unexpected death of Charlie Foster. When he died he was Chairman of the Rochester Chapter of the B.P.A. An obituary written by his close friend, Mr. H. Lou Gibson, is on the next page. In addition Mr. Gibson has written us the following:

"For many years Charlie served on the Hobby Council of the Rochester Museum. He was one of the four Research Fellows of that Institution. He also had been Chairman of the Photography Section of the Rochester Academy of Science.

He has left us the recollections of a friendship that was as cheery and comfortable and stimulating as homespun tweed. He has left an impression in his professional field that is a bit greater than we as average men are destined to make. And there is no more fitting monument for any man than the one he builds himself during his lifetime."

Mrs. Inez Porter was President of the Chicago Chapter at the time of her death. Maria Ikenberg added the following to Mrs. Porter's obituary.

"Inez Porter left us far too early, but she was hopeful to the last that the high professional standards we all aim for may some day be achieved through the Biological Photographic Association. We have lost a good and sincere friend, and an inspiring chairman, whose memory we will cherish."

Charles Stuart Foster
1896-1954

Most Members of our Association knew Charlie Foster personally; those who did not have had many impersonal contacts with him in their work. For one thing, it was his dogged persistence that led to consistency in usage of the term photomacrography. The definition of this word in Webster's dictionary was written by Charlie. His sudden passing on May 10 leaves us with warm memories of him and with his influence on scientific photography.

He was born on December 6, 1896, in Corning, New York. The next date of import to his friends in the Biological Photographic Association marked his entry into the Canadian Army during World War I. Charlie was a vivid raconteur and his experiences with the "Princess Pat's" will be fondly recalled by many of us. After the war he graduated from the University of Applied Science in Chicago, specializing in Criminology, Chemistry and the Science of Fingerprints.

He started on his photographic career with the Eastman Kodak Company in 1929. His specialty was photomicrography and he taught a course in this subject at the Rochester Institute of Technology. For the past several years his responsibility was along service lines in this field as a technical consultant in the Kodak Sales Division. He has helped many of our Members with letters and personal instruction. He drafted the Kodak Data Book on Photomicrography.

Next to forthright social contact with his fellow men, Charlie loved nature and nature photography. He built up a large collection of color slides of wild flowers. These were donated by him to the Rochester Museum of Arts and Sciences several years ago. The colors of crystals in the polarizing microscope and the limitless color schemes of nature intrigued him. He was an expert at making Dye Transfer prints. For the past few years the mechanical precisions of telescope making attracted his talents, and the profundities of astronomical order mellowed an enthusiastic philosophy that saw drama in everything. He had just started a program of celestial photography; and, as in all his Nature photography, he enjoyed the technical challenges it offered.

H. Lou Gibson

Inez Porter

Mrs. Inez Porter, President of the B.P.A. Chicago Chapter, passed away after a long illness on April 24, 1954.

Inez Porter joined the B.P.A. in 1939 and had been an active member of the Chicago Chapter since 1944. Having been a Board Member of the Chapter previously, she was elected President in February, 1953 and reelected in February of this year. During the last two years her department has been host to the Chicago Chapter.

Mrs. Porter was an outstanding photographer — a perfectionist — applying her qualifications to the medical field in which she had worked in another capacity. Her illustrations for the hospital's public relations were unsurpassed. She was gifted with an intuition for photography, not depending on rules and mechanical devices to achieve her results. She accomplished what she had set out to do: to build a Department of Photography at St. Luke's Hospital in Chicago which would compare with the best in the country. Her name has been recognized nationally. Her name has gone down in medical literature as coauthor of a textbook in pathology.

Maria Ikenberg

REPORT OF NOMINATING COMMITTEE

The Nominating Committee, consisting of Miss Anne Shiras, FBPA, Chairman, Mr. C. Graham Eddy, FBPA and Mr. William L. Martinsen, FBPA, have submitted the following slate of nominees for 1955.

PRESIDENT	WARREN STURGIS
VICE PRESIDENT	H. LOU GIBSON
SECRETARY	JANE H. WATERS
TREASURER	ALBERT LEVIN
DIRECTORS	JOHN J. BEITER
(Three Directors to be elected)	ELLA S. BRECKENRIDGE
	PERCY W. BROOKS
	R. A. KOLVOORD
	JOHN E. WITHEE
	VERLIN Y. YAMAMOTO

The election ballot will be sent to all members as a part of the usual Spring Annual Meeting announcement, scheduled for mailing approximately July 1.

In keeping with Article VI of the B.P.A. Constitution and By-Laws, any nominee proposed for an office by a petition of at least ten active members will be added to the official ballot.

NEW B.P.A. MEMBERS

(Jan. 1954 through Mar. 1954)

Robert E. Bevis, Lafayette, Calif.
A. Duane Black, Chicago, Ill.
Sidney E. Blandford, Jr., M.D., Denver, Colo.
Philip P. Bleicher, Pacific Palisades, Calif.
Lt. Dudley Claude Blodget, Pasadena, Calif.
Joseph D. Boggs, Chicago, Ill.
Milton Brown, St. Albans, N.Y.
Frank S. Burt, Bridgeport, Conn.
Bruce Buswell, Wichita, Kan.
Myrna Joyce Chitwood, Loma Linda, Calif.
Allen S. Clarke, Washington, D.C.
Donald J. Currie, M.D., Montreal, Canada
Carmelita A. De Castro, Rochester, Minn.
Sister M. De Lellis, Saint John, N.B., Canada
Capt. William L. Duncan, APO 227, New York, N.Y.
David Feigenbaum, Marblehead, Mass.
William P. Fisklin, Ithica, N.Y.
Ruth R. Fox, Verona, N.J.
Marc Giguere, Cte Montmorency, P.Q., Canada
Frances R. Goldsborough, Harrisburg, Pa.
Werner P. Gugelmann, San Francisco, Calif.
Louise Marguerite Hardy, Cleveland, Ohio
William M. Harlow, Syracuse, N.Y.
Jerome Hartzberg, Buffalo, N.Y.
Lester Heitlinger, Tucson, Ariz.
Dr. David F. Hersey, San Antonio, Tex.
Kerrison Juniper, Jr., M.D., Atlanta, Ga.
Herbert J. Klassen, Boyes Hot Springs, Calif.
T. R. Koestline, Augusta, Ga.
Ira R. Kohlman, Flushing, N.Y.
Helen O. Lang, Chicago, Ill.
Dr. Joseph P. Linden, Jr., Los Angeles, Calif.
James J. McCallion, Staten Island, N.Y.
Ella Faye Miller, Los Angeles, Calif.
Robert L. Miller, W. Los Angeles, Calif.
Jesse E. Nash, Jr., Buffalo, N.Y.
Alfred Owczarzak, Madison, Wis.
Lawrence R. Reynolds, Jr., Rochester, N.Y.
Irwin Rosen, Levittown, N.Y.
Dr. Jack Stern, Chicago, Ill.
Leon Thompson, Purley, Surrey, England
Miguel de Torres-Lucena, Sevilla, Spain
Emil W. Tryczynski, Evanston, Ill.
Clay Van Winkle, Mount Vernon, Ohio
Paul O. Vogelsberg, Lindenhurst, N.Y.
J. M. Walters, Gadsden, Ala.
George W. Wasser, Bronx, N.Y.
Frazer D. White, Evanston, Ill.
Tom C. Woodward, New Haven, Conn.
Harvey B. Woodworth, San Francisco, Calif.
Ronald B. Youngquist, St. Paul, Minn.
Max Ted Zell, Montreal, Canada

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Dr. Edgar C. Baker
A. V. Banones
Edna Campbell Barker
S/Sgt. R. T. Barrus
Earl C. Bartlett
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STELLA ZIMMER

FELLOWSHIP PROCEDURE

Members may propose for Fellowship in the BPA other members whom they consider worthy of recognition. To be eligible for Fellowship a candidate must have been a member of the Association for five consecutive years and must possess one or more of the following qualifications:

Superior craftsmanship in still or motion picture photography of biological subjects. Ability in photographic research in new methods or materials.

(These require submission of evidence.)

Meritorious contributions to biological photography overall through sustained organizational work.

Two sponsors are required. The sponsors should be well acquainted with the candidate's work and should be ready to furnish the Board with details of his experience and achievements. Those who wish to sponsor a member whom they believe to be eligible should request a Fellowship Application form from the Secretary of the Fellowship Committee: Miss Anne Shiras, Photographic Department, Magee Hospital, Pittsburgh 13, Pennsylvania.

CONTENTS

JOURNAL OF THE BIOLOGICAL PHOTOGRAPHIC ASSOCIATION

Volume 22, Number 2 — May, 1954

INFORMATION FROM THE ELECTRONMICROGRAPH . . . . . Edward N. Azarowicz, John O. Erickson and Dorothy M. Armen 49

PHOTOGRAPHY IN SCIENTIFIC RESEARCH . . Oscar W. Richards 52

THE ROLE OF THE CLINICAL PHOTOGRAPHER IN THE PRODUCTION OF SHORT SHORT MOTION PICTURES . David S. Ruhe, M.D. 59

A METHOD OF MOTION AND TIME ANALYSIS FOR THE EVALUATION OF PROSTHETIC DEVICES . . . . . M. S. Gottlieb 64

INDEX TO VOLUME 21 — 1953 . . . . . Center Spread, Roman Numbers I to IV

DIAGRAMS FROM WIRE MASKS . . . . Arthur W. Proetz, M.D. 71

A METHOD OF PREPARING NEGATIVE LANTERN SLIDES . . . . June Hill Pedigo and Louis S. Pedigo 74

THE DIAZOTYPE PROCESS AS UTILIZED AT THE ARMED FORCES INSTITUTE OF PATHOLOGY . . . . . Julius Halsman 76

BOOK REVIEWS . . . . . All reviews by the Editor except that noted by S. J. McComb 80

NEW PRODUCTS 83

YOUR ASSOCIATION 88

OBITUARIES 90

REPORT OF NOMINATING COMMITTEE 91

NEW B.P.A. MEMBERS 91

CONTRIBUTING MEMBERS 92

SUSTAINING MEMBERS, FELLOWS OF THE ASSOCIATION, FELLOWSHIP PROCEDURE . . . . . Inside Back Cover

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